

NAVAL RESEARCH LABORATORY

**2000 BROAD AGENCY
ANNOUNCEMENT**

BAA NO. 01-00

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INTRODUCTION

The Naval Research Laboratory (NRL) is the Navy's corporate laboratory. NRL conducts basic and applied research for the Navy in a variety of scientific and technical disciplines. The basic research program is driven by perceptions about future requirements of the Navy.

NRL conducts most of its research program at its own facilities but also funds some related research such as anticipated by this announcement. More extensive research support opportunities are available from the Office of Naval Research (ONR). ONR announcements may be accessed via the Internet on <http://www.onr.navy.mil> or obtained by writing: Office of Naval Research, Attn: Code 363, 800 North Quincy St., Arlington, VA 22217-5660.

This is the 2000 NRL Broad Agency Announcement (BAA) issued under the provisions of paragraphs 35.016 and 6.102(d)(2) of the Federal Acquisition Regulation (FAR) which provides for the competitive selection of research proposals for scientific study or experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding. This announcement includes all NRL sites, including sites in the Washington, DC area, at the Stennis Space Center, MS, and at Monterey, CA. Proposals submitted in response to this BAA that are selected for award are considered to be the result of full and open competition and are in full compliance with the provisions of Public Law 98-369, "The Competition in Contracting Act of 1984."

NRL is interested in receiving proposals for the research efforts described under this BAA. This announcement is an expression of interest only and does not commit the Government to make any award or to pay for any response preparation costs. The cost of proposal preparation for response to a BAA is not considered an allowable direct charge to any resultant contract or any other contract; however, it may be an allowable expense to the normal bid and proposal indirect cost specified in FAR 31.205-18.

Interested parties should be alert for any BAA amendments that may be published.

Questions may be directed to Deputy for Small Business, at e-mail byrne@contracts.nrl.navy.mil or FAX (202) 767-5896 . Please include your organization, address, e-mail address and phone number. "Initial Proposals" (IP) should **NOT** be sent to this e-mail address. **PLEASE DO NOT CONTACT ADDRESSES LISTED UNDER EACH RESEARCH INTEREST, EXCEPT TO CONFIRM RECEIPT OF THE "Initial Proposal" , if necessary.** See Proposal Preparation and Submission Instructions.

Prospective offerors are cautioned that only the contracting officer is legally authorized to commit the Government.

Funds may not be currently available for topics under this BAA. No contract award will be made for a topic until appropriated funds are available from which payment for contract purposes can be made.

NRL encourages Educational Institutions, Small Businesses (SBs), Small Disadvantaged Business Concerns(SDBs) and Historically Black Colleges and Universities(HBCUs) and Minority Institutions(MIs) to submit proposals under this BAA.

NAVAL RESEARCH LABORATORY MISSION

The mission of NRL is to conduct a broadly based multidisciplinary program of scientific research and advanced technological development directed toward new and improved materials, equipment, techniques, systems, and ocean, atmospheric and space sciences as well as related technologies and operational procedures for the Navy.

The Navy's operational effectiveness depends on its ability to keep pace with rapidly developing technologies. NRL contributes to this requirement by conducting research in the following areas, organized into NRL'S three research directorates and Naval Center for Space Technology:

SYSTEMS DIRECTORATE - CODE 5000

NRL performs basic research and development for major Navy systems. The emphasis is on radar, electronic warfare, optical systems, and the integration of these primary sensors by communications and battle management systems. The Laboratory conducts an extensive experimental program in the field, using both ship and aircraft platforms to support the above activities. The Laboratory conducts research across a broad spectrum of information sciences; this research includes high performance computing and networking, information and communications security, artificial intelligence and formal methods for software engineering as major research areas; a number of programs exploit technology for Navy needs including decision support systems, active control, parallel processing, virtual reality and modeling and simulation of Naval systems.

**MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE
CODE 6000**

The Laboratory carries out a multidisciplinary research program whose objectives are the discovery and exploitation of new improved materials, the generation of new concepts associated with materials behavior, and the development of advanced components based on these new and improved materials and concepts. Theoretical and experimental research is carried out to determine the scientific origins of materials behavior and to develop procedures for modifying these materials to meet important naval needs for advanced platforms, electronics, and photonics. The program includes investigations of a broad spectrum of materials including insulators, semiconductors, superconductors, metals and alloys, optical materials, polymers, plastics, and artificially structured biomolecular materials and composites, which are used in important naval devices, components, and systems. New techniques are developed for producing, processing, and fabricating these materials for crucial naval applications. NRL research establishes the properties and limits of performance of these materials in natural or radiation environments, of components under adverse conditions such as those associated with the marine environment, of neutron or directed energy beam irradiation, or of extreme temperatures and pressures.

**ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE
CODE 7000**

NRL is interested in the fields of acoustics, remote sensing, oceanography, marine geosciences, marine meteorology, and space science (phenomenology focus). Areas of emphasis in acoustics include advanced acoustic concepts and computation, environmental acoustics, acoustic signal processing, physical acoustics, acoustic systems, ocean acoustics, and acoustic simulation and tactics. Areas of emphasis in remote sensing include radio, infrared, and optical sensors, remote sensing physics, imaging systems and research, and remote sensing applications. Areas of emphasis in oceanography include ocean dynamics and prediction, ocean sciences, small scale phenomenology, and ocean technology. Areas of emphasis in marine geosciences include marine physics, seafloor sciences, and mapping, charting, and geodesy. Areas of emphasis in marine meteorology include prediction systems and forecast support. Areas of emphasis in space science include ultraviolet measurements, x-ray astronomy, upper atmospheric physics, gamma and cosmic rays, solar physics, and solar terrestrial relationships.

**NAVAL CENTER FOR SPACE TECHNOLOGY
CODE 8000**

NRL activities extend from basic and applied research through advanced development in all areas of interest to the Navy space program. These activities include developing spacecraft and ground command and control stations. Principal functions include understanding and clarifying requirements, recognizing and prosecuting promising research and development, analyzing and testing systems to quantify their capabilities, developing operational concepts that exploit new technical capabilities, system engineering to allocate design requirements to subsystems, and engineering development and initial operation to test and evaluate selected spacecraft subsystems and systems. The Laboratory provides systems engineering and technical direction assistance to system acquisition managers of major space systems. In this role, technology transfer is a major goal and motivates a continuous search for new technologies and capabilities and the development of prototypes that demonstrate the integration of such technologies.

ELECTRONIC ACCESS

The NRL-wide BAA and revisions is available on the Contracting Division's World Wide Website at <http://heron.nrl.navy.mil/contracts/home.htm>. If access via the World Wide Web is unsatisfactory, printed copies may be requested by letter addressed to Naval Research Laboratory, Attn: Deputy for Small Business, Code 3204, 4555 Overlook Avenue, SW, Washington, DC 20375-5326 (FAX (202) 767-5896).

The following Websites provide information about NRL.

NRL Homepage: <http://www.nrl.navy.mil>

NRL Informational Publications: <http://tid-www.nrl.navy.mil>

- NRL Fact Book
- NRL Annual Review
- NRL Facilities Book.

AWARD CONSIDERATIONS

The selection of proposals for contract award will be based on a scientific review of proposals submitted in response to each BAA. The major purpose of the evaluation will be to determine the relative merit of the technical approach of each proposal. Business and contractual aspects, including proposed cost and cost realism, will also

be considered as part of the evaluation. Selection of proposals for award will be based on the potential benefits to the Government weighed against the cost of the proposals, in view of the availability of funds.

Specific evaluation criteria are as follows:

(1) Degree to which new and creative solutions to technical issues important to NRL programs are proposed and feasibility and the offeror's understanding of the proposed approach and technical objectives.

(2) The offeror's ability to implement the proposed approach as demonstrated by specific accomplishments in the technical field to be studied, by the qualifications (including past performance) of the proposed principal investigator and other personnel and availability of appropriate facilities.

(3) The degree to which technical data and/or computer software developed under the proposed contract are to be delivered to the NRL with rights compatible with NRL research and development objectives.

(4) Proposed cost and cost realism.

(5) The extent to which offerors identify and commit to small business and to small disadvantaged business, historically black college and university, or minority institution participation in the proposed effort, whether as a joint venture, teaming arrangement, or subcontractor.

THE GOVERNMENT RESERVES THE RIGHT TO SELECT FOR AWARD ANY, ALL, PART, OR NONE OF THE RESPONSES RECEIVED.

IMPORTANT

Certain proposals are not appropriate under this BAA and are not desired. Engineering and technical services proposals are not appropriate. These usually involve applying effort toward a broadly identified task, often on a level-of-effort basis, rather than delivery of an end item (such as a final research report). Some projects are too mature to be performed under BAA authority; as a general rule, efforts subsequent to proof of concept and validation of technology are too mature. For example, it would not be appropriate under this BAA to modify existing products to fulfill specific requirements or to test products to determine their suitability for a specific application. Deliverables should demonstrate the results of scientific study and experimentation rather than focus on a specific system or hardware solution. NRL is not interested, under its Broad Agency Announcement program, in concepts that have already been developed or

proven (even if they have never been sold before), nor are proposals for evolutionary engineering of improvements appropriate under BAA authority. These cautions apply to all BAA topics. Please note that some efforts prior to proof of concept and validation of technology may also be too mature. A determination of appropriateness will be made on a case-by-case basis.

PROPOSAL PREPARATION

General Information

Eligibility

To be eligible for award of a contract, all prospective offerors, with the exception of other governments, including state and local government agencies, must meet certain minimum standards pertaining to financial resources, adequacy of accounting systems, ability to comply with performance schedules, prior record of past performance, integrity, organization structure, experience, operational controls, technical skills, facilities and equipment. For additional information and guidance concerning qualifications and standards for responsibility of prospective contractors, refer to Part 9 of the FAR.

Proposal Preparation and Submission Instructions

Interested offerors must first submit Initial Proposals (IPs). The purpose of an IP is to preclude unwarranted effort on the part of an offeror whose proposed work is not of interest. IPs should not exceed 30 pages in length, including a cost estimate. BREVITY IS DESIRABLE - IPs RANGING FROM A FEW PAGES TO 15 PAGES ARE THE NORM. Cost estimates in IPs for stand-alone subsets of efforts are encouraged. Offerors of those IPs found to be consistent with the intent of the BAA will be invited to submit formal cost and technical proposals. An invitation does not assure an offeror of a subsequent contract award. See Part I for special instructions under some "Research Interest" topics.

Submit one original and three copies of each IP to the technical point of contact shown under Research Interest topics in Part I.

General Information for Formal Cost and Technical Proposals

Because both the technical and cost aspects of an offeror's submission will be evaluated at the same time, it is desirable that one volume containing all information be submitted. In presenting the proposal material, prospective offerors are advised that quality of the information is significantly more important than the quantity. Therefore, offerors are requested to confine their submissions to essential matters, providing sufficient information to define their offer and establish an adequate basis for the Government to conduct its evaluation.

Pursuant to the requirements of FAR 19.702 and 52.219-9, DFARS 226.7007 and DFARS 252.219-7000, if the total amount of the proposal exceeds \$500,000 and there are subcontracting possibilities, offerors are to prepare and submit a subcontracting plan for Small Business, Small Disadvantaged Business, and Women-Owned Small Business (WOSB) concerns or Historical Black Colleges and Universities and Minority Institutions (HBCUs/MIs) as part of their proposal submission. (Small business offerors do not have to submit the plan.) Offerors are cautioned that the Government will not execute a contract unless the Contracting Officer determines that the plan provides the maximum practicable opportunity for SBs, SDB, and WOSB concerns or HBCUs/MIs to participate in the performance of the contract. Offerors should note that DFARS 219.705-4 and 226.7000 have provided for a goal of 5% for SDB concerns or HBCUs/MIs. Subcontracting plans which provide for less than the aforementioned goal must be accompanied by sufficient evidence that all reasonable attempts to meet the 5% goal have been made. Acceptable plans will be included in resultant contracts.

Content of Formal Research Proposals

Submit one original and three copies to technical point of contact shown under Research Interest topics in Part I.

The addresses for submission of Initial Proposals are:

For Washington, DC organizational codes (Area Code (202)):
Naval Research Laboratory
4555 Overlook Ave., SW, ATTN: Code (Topic)
Washington, DC 20375-5320

For NRL at the Stennis Space Center, MS (Area Code (228)):

(Topics 955, 966, 968, and 969))

Naval Research Laboratory

Code ATTN: (Topic)

Stennis Space Center, MS 39529-5004

For NRL at Monterey, CA (Area Code (408)): (Topic 970)

Naval Research Laboratory

Code ATTN: (Topic)

Monterey, CA 93943-5006

The technical portion of the proposal must include a full discussion of the nature and scope of the research effort contemplated, including the method of approach and the expected results. A program milestone chart, which includes a detailed list of tasks and subtasks and the duration of same, must be provided. Offerors are to clearly identify a list of contract deliverables which are trackable to the milestone chart. These milestones should include the timeframes for preparation, delivery, review and approval for all draft and final reports, as appropriate. Offerors must include any information pertaining to prior significant and related work experience as well as description of available facilities and the resumes of all personnel who will be participating in the effort. Offerors must keep in mind that the technical portion of the proposal is usually incorporated by reference into any resultant contract; it serves as the basis for work to be accomplished. Therefore, the technical proposal must include a statement of work that describes the work to be accomplished and any deliverables; each task description should be written to facilitate evaluation and acceptance without the need for major rewrites prior to incorporation into the resultant contract.

The offeror should prepare its cost proposal in a clear, concise manner that accurately reflects its financial plan for accomplishing the proposed technical effort. A breakdown of cost data is required under this BAA. If "cost or pricing data" are required to be submitted in accordance with FAR 15.403-4, "Requiring Cost or Pricing Data," the offeror shall provide the information identified in FAR 15.408, "Solicitation Provisions and Contract Clauses/Price Proposals When Cost or Pricing Data Are Required," as well as the information required in this section. When cost of money is being proposed, the offeror shall submit a DD Form 1861.

The breakdown of "cost or pricing data" or "other than cost or pricing data" shall include all cost expected to be incurred under the contract. IT IS ESPECIALLY IMPORTANT THAT ADEQUATE DATA ON SUBCONTRACTORS BE PROVIDED; RATES ARE PARTICULARLY IMPORTANT. THE ABSENCE OF ADEQUATE DATA

ON SUBCONTRACTORS IS A FREQUENT SOURCE OF AVOIDABLE DELAY IN CONTRACT AWARD. THE CONTRACTOR MAY ENCOURAGE SUBMISSION BY THE SUBCONTRACTOR DIRECT TO THE GOVERNMENT TECHNICAL POINT OF CONTACT IF THE SUBCONTRACTOR IS RELUCTANT TO SUBMIT DATA TO THE PRIME. Prime contractors are responsible for insuring that each proposed subcontract is supported by cost or pricing data when it is both in excess of \$500,000, and not covered by an exception or waiver in accordance with FAR 15.403-1. Particular attention is directed to the importance of furnishing complete detailed information and supporting data as indicated in FAR 15.408, Table 15-2.

All details, broken down by cost element, are to be prepared for each major task long with supporting rationale. All cost details shall be broken down to coincide with the offeror's accounting periods as related to the specific period of performance as indicated in the proposed milestone chart. The level of detail should be commensurate with the cost proposed for proposals not involving "cost or pricing data." A sample format for a summary cost proposal is provided below.

Sample Summary Cost Proposal Format

Cost Element	Base	Rate	Total Cost	Reference
Labor				
John Doe or	5000 Hours	\$12.00	\$ 60,000	
Sr. Engr	5000 Hours	12.00	<u>60,000</u>	
Total Direct Labor	10000 Hours		\$120,000	Exhibit A
Overhead		50.00%	\$ 60,000	Exhibit B
Other Direct Cost				
Subcontract			50,000	Exhibit C
Computer			75,000	Exhibit D
Travel			100,000	Exhibit E
Consultant			<u>65,000</u>	Exhibit F
Subtotal			\$470,000	
G&A Expense		10.00%	<u>47,000</u>	Exhibit G
Total Estimated Cost			\$517,000	
Fixed Fee		5.0%	25,850	
Cost of Money			<u>20,000</u>	Exhibit H
Cost Plus Fixed Fee			\$562,850	

Funding Profile

The Government anticipates that any contract resulting from this BAA will be funded on an incremental basis as provided by FAR 52.232-22, "Limitation of Funds."

Certificate of Current Cost or Pricing Data

Upon completion of negotiations and agreement on contract price, any required certificate of current cost or pricing data pursuant to FAR 15.403-4 shall be submitted by the offeror. In addition, any offeror who is required to submit and certify cost or pricing data shall submit or ensure the submission of accurate, current and complete cost or pricing data from his prospective subcontractors if the requirements for certified cost or pricing data apply to the subcontractors.

Contract Representations and Certification

Each offeror will be required to submit Representations and Certifications and other statements of offerors, or respondents. This document is available for downloading at <http://heron.nrl.navy.mil/contracts.reps&certs.htm>.

Electronic Submission Formal Cost Proposal

Prospective offerors are encouraged to submit their cost proposals on electronic media using either Microsoft Excel 97 or Lotus 1-2-3 Release 5 or compatible. Each spreadsheet shall contain all formula or equations used to compute individual line items, as appropriate, as well as total cost, (i.e., sell price). Spreadsheets for the basic program effort as well as any proposed options must also be submitted. Total dollar spreadsheeting without a breakout of the individual elements of expense and associated calculation formula is not acceptable.

Submission of electronic cost data does not relieve the offeror from the responsibility for submission of an original signed hard copy of the cost proposal along with all supporting rationale. Offerors must prepare a cross-reference identifying the data on disk to that contained in the hard copy and include it as part of both the hard copy submission and the diskette. It must contain the following data:

Disk Name: The disk name under which the file is stored

File Name: The file name of the data file

Hard Copy
Reference: Include volume and page number

Description: A brief description of the data
(e.g., labor rates, bill of material, etc.)

Contract Type

The Government contemplates award of cost, cost-plus-fixed-fee, or cost sharing types of contracts under this BAA. Proposals based on a type of contract other than that contemplated will be considered, but offerors are advised that the Government is under no obligation to accept same. When appropriate, grants may be used to support selected proposals from educational and nonprofit research organizations. Cooperative Research Agreements may be awarded for cooperative research efforts.

In accordance with DFARS 235.70, NRL may use the Research and Development Streamlined Contract Format in making awards. The format is available for viewing and downloading at <http://www.rdss.osd.mil/format/format01.html>

Restrictive Markings on Proposals

If information contained in the proposal is in the public domain or cannot be protected under law as a trade secret (e.g., a patent application), the Navy will not accept liability for failure to safeguard against open disclosure. If a responder wishes to restrict the proposal, the responder should mark the title page with the following legend:

"This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used or disclosed in whole or in part for any purpose other than to evaluate the proposal, provided that if a contract is awarded to this BAA responder as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use or disclose the data to the extent provided in the contract. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained on pages ____."

The pages to which the above restriction applies shall be marked with the following legend:

"Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal."

The offeror whose proposal contains no limited rights data is required to so state in order that misunderstandings may be avoided.

**Contractor Information Number (CIN)
(formerly known as the Contractor Establishment Code)**

Offerors are required to supply the Contractor Information Number (CIN) (FAR 4.602(d)) applicable to the proposed program. If the offeror does not have a CIN, it should contact either the cognizant administrative contracting officer or the local Dun and Bradstreet Branch Information Services office for assistance. Prospective offerors should not delay submission of their offers pending receipt of their codes. Offerors should indicate in their proposal submission that they are in the process of obtaining this information.

Central Contractor Registration

Offerors are required to register in the DOD Central Contractor Registration database prior to award of any contract (DFAR 252.204-7004). Offerors may obtain information on registration and annual confirmation requirements by calling 1-888-227-2423 or via the Internet at <http://www.ccr 2000.com>

Additional Information

Any requests by offerors for Government furnished property must be clearly identified in the proposal. The Government, however, is under no obligation to comply with such requests. Therefore, offerors should make provision for alternate technical approaches in the event the Government is unwilling to provide the property requested. Unless specifically identified under the BAA description, all work to be performed under any resultant contract will be unclassified and will not involve access to classified information.

Reports and Program Reviews

As a minimum, all offerors will be required to submit monthly financial and technical status reports and a final technical report. Depending on the duration of the program, offerors may be required to prepare semiannual and/or annual interim reports. The Government negotiator will work out an appropriate Contract Data Requirements List (CDRL) with each successful offeror unless a CDRL is not appropriate.

Depending on the nature of the research program and the duration of same, the Government may require that the contractor attend program reviews at NRL or within CONUS. In addition to these formal program reviews, informal reviews may be scheduled as deemed necessary by cognizant technical personnel. Requirements for program reviews will be determined when proposals are selected for award.

A monthly expenditure plan and disbursement rate report are required and may be included in the financial report. The disbursement report must include the forecast of billings to the Government and the total cumulative amounts billed through the report month.

Exhibits supporting the summary proposal may be in contractor format. However, the information must be clear, concise and suitable for evaluation. For example, proposals which include raw materials or purchased parts essential to performance must include a list or bill of material containing for each significant item at least an item description, part number if known, quantity, unit price, extended price, tentative source (if known), and basis (i.e., identification as a purchase order, verbal quote, written quote, whether or not competitive, catalog price, engineering estimate, etc.).

BAA RESEARCH INTERESTS

**RADAR TECHNOLOGY
BAA 001**

The Target Characteristics Branch of the Naval Research Laboratory (NRL) conducts research and development into concepts and techniques for improving the capabilities of Naval shipboard radars. Focus is on the consideration of: innovative ideas for increasing the power-aperture product and/or reducing the cost of systems; novel ideas or architectures for transmitters, receivers, and transmit/receive (T/R) modules; waveforms, and algorithms for more efficient extraction of information from the received signal in the presence of clutter and noise; novel ideas or architectures for antennas which would allow increased capabilities, lower weights, or both; and novel operating modes for more efficient utilization of hardware resources and more rapid establishment of tracks.

Any proposal should provide for addressing the value added to system performance by contrasting the proposed technique/idea with conventional techniques/technology. This may be done by direct comparison or a parametric trade-off analysis of sufficient depth to assess gains when the technique does not permit direct comparison.

Address Initial Proposals to Mr. M. Walder, Code 5342, or e-mail: walder@nrl.navy.mil, Fax: (202) 404-8687, telephone (202) 404-1864. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**NONLINEAR MICROWAVE DIELECTRICS
BAA 002**

The Radar Analysis Branch of the Naval Research Laboratory (NRL) conducts research and development into concepts and techniques for using radar antennas to meet U.S. Navy missions. The Radar Analysis Branch is interested in developing radar antennas incorporating nonlinear dielectrics. Ferroelectrics are the most common nonlinear dielectrics. The high microwave loss of most ferroelectrics has prevented their use in microwave antennas.

The Radar Analysis Branch is interested in receiving proposals for investigating techniques to reduce the microwave loss of nonlinear dielectrics while maintaining a usable degree of nonlinearity (tunability).

Address Initial Proposals to Code 5317, or e-mail rao@radar.nrl.navy.mil, telephone (202) 767-2578. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**HIGH FREQUENCY RADAR
BAA 003**

The Systems Section of the Advanced Radar Branch of the Naval Research Laboratory (NRL) conducts research and development in concepts and techniques for using high frequency radar to meet U.S. Navy mission requirements. Focus is on high frequency electromagnetic wave propagation and scattering (skywave and surface wave), radar system performance forecasting, radar system testing, radar data transfer, signal processing methodologies, spread Doppler clutter mitigation and use of the radar return to classify targets.

The Advanced Radar Branch is interested in receiving proposals for research related to these research interests.

Address Initial Proposals to Code 5324, by e-mail at thomason@radar.nrl.navy.mil, telephone (202) 767-5926. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**RADAR TECHNOLOGY FOR LITTORAL TARGETING
BAA 004**

The Airborne Radar Branch of the Naval Research Laboratory (NRL) conducts research and development into concepts and techniques for improving the long-range air, sea, and ground surveillance capabilities of Naval airborne radars. Current interest is in innovative technologies for wide-area surveillance and targeting of fixed or slow moving ground targets within the littoral battlespace with consideration of: novel ideas or architectures for detection, classification, accurate location, and targeting; novel operating modes or system concepts for wide-area, high-resolution imaging of targets within the littoral battlespace which allow the aircraft to perform its mission while standing off at a longer range; waveforms, architectures, and algorithms for more efficient extraction of targeting information from the received signal in the presence of clutter and noise; and more rapid establishment of targeting parameters.

Any proposal should provide for addressing the potential value added to system performance by contrasting the proposed technique/idea with conventional techniques/technology. This may be done by direct comparison or a parametric trade-off analysis of sufficient depth to assess gains when the technique does not permit direct comparison.

Address Initial Proposals to Code 5311, e-mail: nrlcode5360@ccf.nrl.navy.mil, Fax: (202) 404-7572, telephone (202) 767-2569. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**ARTIFICIAL INTELLIGENCE TECHNOLOGIES
BAA 005**

The Navy Center for Applied Research in Artificial Intelligence (NCARAI) of the Naval Research Laboratory (NRL) is engaged in research and development efforts designed to address the application of artificial intelligence (AI) technologies and techniques to critical Navy and national problems. The emphasis at NCARAI is on the linkage of theory and application in demonstration projects that use the full spectrum of AI methods. Current research and exploratory development is concentrated in the following areas: machine learning (knowledge representation, genetic algorithms, induction, cognitive information processing); natural language understanding (syntactic and semantic analysis, discourse analysis, interfaces to decision aids and virtual environments, spoken language processing); intelligent decision aids (simulation, validation, intelligent tutoring, reasoning under uncertainty; case-based reasoning); sensor-based systems (range-image processing, intelligent control), and advanced technology for human-computer interaction. In conjunction with these interests, topics in advanced reasoning, planning, and distributed AI may be addressed.

Not all of the branch mission areas mentioned above are allowable as BAA projects. In particular, specific applications and demonstrations are too mature to qualify under BAA authority.

Address Initial Proposals to Code 5510, or e-mail: alanm@aic.nrl.navy.mil, telephone (202) 767-2884. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**RESEARCH IN SOFTWARE ENGINEERING
BAA 006**

The objective of Naval Research Laboratory (NRL's) software engineering program is to establish the scientific foundations needed to improve the practice of software engineering in the development and maintenance of software systems in the Navy. The program addresses fundamental problems in formal specification languages and notation verification, and software tools that support formal specification and verification. Problems in specification languages include the use of mathematical models to define language semantics and the invention and evaluation of language constructs for specifying the functional and timing behavior required of a software system. Verification involves formal approaches to the problem of proving that a software specification has certain functional and timing properties. Current specification languages and verifiers do not handle both functional and timing requirements, employ limited timing models, and may not scale to real-world Navy systems. Current tools generally support only the coding phase and do not support the specification of functional and timing requirements, iterative specification and development, and verification of specifications. Tools of interest include static analysis tools, such as tools that check a software specification for self consistency and those that provide formal verification that a specification has certain properties, and dynamic analysis tools; i.e., those which allow the user to construct and run an executable version of a software specification.

Awards under this BAA will be for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding, and this will not be focused on a specific system or hardware solution. Proposals for evolutionary improvements are not appropriate under BAA authority and are not desired.

Address Initial Proposals to Code 5546, e-mail at heimeyer@itd.nrl.navy.mil. Contact by telephone is strongly discouraged. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**RESEARCH IN WIRELESS AND SATELLITE BASED NETWORKING
BAA 007**

Emerging DoD communication needs require seamless high data rate (HDR) connectivity to support constant, variable, and available bit rate services using wireless and satellite based architectures. HDR multi-media traffic from a multitude of heterogeneous networks with world wide seamless connectivity is the emerging DoD requirement. Data rates available on terrestrial based ATM and SONET networks and shipboard local area networks (LAN) are out-pacing the ability of wireless (satellite, line-of-sight, radio, optical ...) links to DoD forces that are not suited for hard wired connectivity. HDR wireless wide area networks (WAN) and LANs will require capabilities not currently available. Dynamic access schemes, network management capability, bandwidth efficient modulations, power control algorithms, and related services will need to be addressed to provide seamless connectivity in an efficient manner. It is anticipated that the above, and related, subjects will be addressed in the context of the lower three layers (physical, data link, and network) of the OSI network model. Innovative techniques are sought to address these areas as well as other concerns in developing and deploying HDR connectivity to forces not able to connect too fixed infrastructure.

The Naval Research Laboratory (NRL) Code 5550 has existing projects to support HDR SATCOM and HDR networking to small combatants. Existing programs have focused on code division multiple access (CDMA) in an attempt to exploit processing gain and to enable the use of small antenna structures. TCP/IP and ATM are typically utilized as the layer 2 and higher network standards over the wireless links. Existing works have focused on Ku and Ka band satellites, but future work should not be limited to these bands. HDR efforts to date have demonstrated near T1 (1.544Mbps) bi-directional connectivity from 60cm parabolic antenna over commercial Ku band satellites and nearly OC12c rates over a Ka band satellite (ACTS). Line-of-sight links have demonstrated near T1 rates using commercial spread spectrum wireless technology. Future efforts are seeking to improve upon this capability by increasing data rates, improving bandwidth efficiency, improving multiple access capability, increasing network capacity, reducing the size of antenna structure, mitigating interference challenges, and improving the capability of wireless and satellite connectivity.

NRL is not interested, as part of this BAA, in developed products or concepts that have been proven effective. The BAA is for research topics in support of potential HDR wireless connectivity improvements. Novel techniques, improvements to the state-of-the-art, scientific study, and experimentation are the desired result of efforts

funded via this BAA. Deliverables should not focus on hardware implementations but rather on results from investigative efforts and experiments.

Address initial proposal to Code 5554, or e-mail krout@itd.nrl.navy.mil, FAX (202) 767-3377, telephone (202) 404-4668. Allow one month before requesting confirmation of receipt of initial proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an initial proposal by NRL. If necessary, NRL will initiate substantive contact.

**ADVANCED INFORMATION TECHNOLOGY
BAA 008**

The Advanced Information Technology Branch of the Naval Research Laboratory (NRL) conducts research and development into software solutions in a number of application areas. The following list of branch interests is provided both to indicate potential topics for BAA proposals and to provide an overview of branch interests for perspective proposals; some of the latter interests are not appropriate for BAA proposals as they require level of effort services - appropriate for a Government staff but not for a BAA project - or are too mature technologically. Current and anticipated areas of interest include: software and display technology for parallel and distributed systems; novel concepts in filtering and data fusion; introduction of natural environment into distributed simulation with emphasis on dynamic effects; development of hardware independent systems for developing and porting code for parallel processing architectures; and visualization research focusing on volume visualization, virtual reality and augmented reality.

The Branch has a continuing research interest in the rapid prototyping of decision support systems. Current work focuses on research and development of software systems for resource allocation, multiple interdependent routing, information fusion, mission rehearsal, plan assessment, contingency planning, network centric warfare, and management of associated databases including three-dimensional terrain.

NRL is also involved in the development of advanced distributed simulation technology with emphasis on faster than real time processing, multicast applications, modeling and assessment for developing environmental effects, latency and other problems associated with distributed systems. Additional areas of current interest include undersea effect, terrain and cultural feature database visualization, and models of communication networks capable of functioning in a distributed simulation environment.

The branch conducts research and development in virtual reality (VR) and is interested in all aspects of the virtual reality including interfaces, representations, volume rendering, augmented reality, and novel applications for training, engineering and decision support. In all cases, NRL is particularly interested in the underlying research and in working with novel hardware and software systems.

The Advanced Information Technology Branch is interested in receiving proposals for innovative research and development in most of the above areas, but

SOME BRANCH MISSION AREAS ARE NOT SUITABLE AREAS FOR ALLOWABLE PROJECTS UNDER BAA AUTHORITY.

Address Initial Proposals to Code 5580, or e-mail numrich@ait.nrl.navy.mil. telephone (202) 767-3567. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SCALABLE, MASSIVELY PARALLEL SOLUTIONS TO
SCIENTIFIC PROBLEMS
BAA 009**

The Center for Computational Science of the Naval Research Laboratory (NRL) is interested in receiving proposals for cooperative research in emerging scalable leading edge technologies relevant to high performance (HP) distributed computing, wide area networking, and collaboration technology for High End Computing (HEC). Research in the center involves work with scalable massively parallel processing for scientific problems undertaken as part of the NRL, ONR and High Performance Computing Modernization Office (HPCMO) programs; research is ongoing in the areas of virtualization, collaboratory and conferencing environments; multi-gigabit, multimedia network technology; advanced software technology for distributed multi-terabyte file systems; prototype environments for the design of scalable, object oriented large multimedia databases for digital library, archival and retrieval; and stream and compression technology for transmission of progressive scan digital video.

The proposed research in networking and computing infrastructure should focus on prototyping a ubiquitous, transparent information infrastructure. The research objective is to investigate and develop innovative approaches and techniques that have potentials to create superior revolutionary rather than evolutionary advances in computing, communications, display and information infrastructures. In addition to software and emerging hardware advances, NRL seeks new methodologies for interconnecting heterogeneous systems through high speed network technology; wavelength division networking and soliton technology; gigabit stream access to remote assets over commercial networks; leading edge switch architectures capable of end-to-end streams with QoS guarantees. Emerging systems should be accessible through standard languages such as High Performance Fortran (HPF) and/or message passing (MPI) and support an object oriented programming environment.

Address Initial Proposals to Code 5590, or e-mail at dardy@cmf.nrl.navy.mil telephone (202) 404-7028. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**OPTICAL SCIENCES R&D
BAA 010**

Optical Science Division (NRL 5600) of the Naval Research Laboratory (NRL) is seeking proposals for innovative research supporting ongoing programs within the Optical Sciences Division related to a wide variety of topics in the following areas:

(1) The generation, propagation, detection and uses of radiation in the wavelength region between the near-ultraviolet and far-infrared wavelengths, including theoretical and experimental work in the following areas: molecular and atomic physics as applied to the development of high power lasers and the exploitation of these sources for doing basic physics research (Code 5640).

(2) Materials research and development for infrared-transmitting optical fibers, glass fiber fabrication techniques, purification of glass starting materials; novel crucible drawing techniques and materials, specialty fibers for chemical sensor applications, techniques for making chemical sensors, glass and processing techniques for making IR fibers, especially chalcogenide and heavy-metal oxide fibers (Code 5603).

(3) Fiber optic sensors for detecting acoustic, magnetic and electric fields, rotation rate, strain, temperature, pressure, chemical, and other parameters; optical multiplexing, demultiplexing, and demodulation using frequency, wavelength and time division techniques; high frequency data transfer networks using fiber optics; signal processing in fiber optic links; optical-microwave delay lines for gigahertz signal transmission, high frequency directly modulated diodes and external modulators, and high speed detectors (particularly any aforementioned device that reduces delay line loss); optical fibers with high mechanical strength, survivable coatings, and low bending loss; integrated optic devices for sensors, optical-microwave delay lines, signal processing, networks, digital or analog communication links; fiber devices such as amplifiers, fiber lasers, super-luminescent fibers, and phase shifters; laser diodes that meet military specifications and can operate in the multigigabit/s range; harmonic generation and mixing using laser diodes; nonlinear effects that impact fiber optic links such as soliton propagation, Brillouin scattering, and four-wave mixing (Code 5670).

(4) Electro-optical, visible, infrared, and multi spectral technologies used in systems for reconnaissance and surveillance; infrared countermeasures and related systems for Navy aircraft; missile approach warning, fire control, missile guidance, and countermeasures' technology, atmospheric propagation effects relevant to missile warning, laser countermeasures, and imaging; laser warning components and systems;

laser countermeasure techniques; electro-optical sensor technology including focal plane arrays and signal processing; electro-optical components; signal processing and data compression for multi color electro-optical and infrared sensors; neural network processing and electronics particularly applicable to electro-optical sensors; advanced data compression techniques and electronics for very large area visible, infrared, and multi spectral imaging sensors (Code 5630).

(5) Materials research and development for specialty glasses and fibers for sensor applications and nuclear radiation hardness; glass and processing techniques for nanochannel glass technology; novel nonlinear optical materials; photonic band-gap materials; narrow band gap superlattices; quantum wells, wires and dots; novel nonstructures; and materials for space survivable optics. Methodologies for protection of Infrared Focal Plane Arrays against intense laser radiation; the interaction of light with single microdroplets; novel laser cavity concepts; organic light emitting sources; optical limiters and switches (Code 5610).

(6) Technology issues in reconnaissance and in the surveillance of air, ocean, and ground targets, from space, air, and surface platforms by electro-optical means, especially multispectral infrared imaging, algorithmic development, including digital image and signal processing algorithms for target detection and tracking; optical signal and image processing; optical properties of materials and coatings; the measurement and theory of optical signatures of air and ocean targets; the acquisition, and characterization and simulation of large-area background imagery; high-speed digital optical/RF communications in a tactical environment, including architectural issues (Code 5620).

Address Initial Proposals to Code 5602 or e-mail at nrl5602@ccf.nrl.navy.mil, telephone (202) 767-2855. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**VIS-IR GLASS WINDOWS AND HEAVY METAL OXIDE GLASSES
BAA 011**

The Naval Research Laboratory (NRL) is interested in new and advanced technology for making large (20 inch) diameter glass windows which transmit in UV-Visible and infrared wavelengths. The window material should be based on an oxide glass.

NRL seeks proposals on (1) scientific and technological study and experimentation directed towards advancing the state of the art towards making large defect free low loss large windows with wide band Anti-reflection coatings.

Address initial proposals to Code 5606, or e-mail ishaggar@ccf.nrl.navy.mil, telephone (202) 767-9316. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**LOW LOSS, NEAR AND MID-IR TRANSMITTING FIBERS
BAA 012**

The Naval Research Laboratory (NRL) is interested in new and advanced technology techniques for making low loss, near-, mid- and long-IR transmitting preforms and fibers. Innovative techniques to process infrared glasses into low loss optical fibers are needed. The techniques currently used for obtaining infrared fiber are direct extrusion of glass from the melt or by fabrication of chalcogenide and Barium Gallo Germinate glass preforms which are subsequently drawn into optical fiber. Potential new preform, fiberization and purification techniques are needed to attain the intrinsic low loss of the glasses.

Address Initial Proposals to Code 5606, E-mail ishaggar@ccf.nrl.navy.mil, telephone (202) 767-9316. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**LASER THREAT COUNTERMEASURE TECHNOLOGY
BAA 013**

The Applied Optics Branch (Code 5630) of the Naval Research Laboratory (NRL) is interested in receiving proposals for research supporting the development of countermeasures against laser-guided or laser-aided threats, such as laser beamrider missiles, laser designators, and laser rangefinders. Of these, laser beamriders are the highest priority threat. Innovative new techniques which support laser countermeasures are desired.

NRL is not interested in concepts which already have been proven. Results of the research should be directed toward demonstrating the generic effectiveness of a countermeasure technique or technology, rather than focusing on a specific system or hardware solution. General studies of countermeasure techniques are not desired. Innovative new approaches to laser beamrider detections are desired.

Address Initial Proposals to Code 5630, or e-mail patten@ccsalpha2.nrl.navy.mil, telephone (202) 767-3049. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**IMAGING SEEKER ADVANCED COUNTERMEASURES
BAA 014**

The Applied Optics Branch of the Naval Research Laboratory (NRL) is interested in receiving proposals that support research into countermeasure technology and countermeasure techniques against advanced anti-air and anti-ship imaging infrared seekers. NRL is interested in organizations with a strong knowledge of imaging tracker design and processing to conduct the countermeasure research. Offerors must also have background in the use of modeling and simulation tools for imaging seekers to conduct countermeasure research.

NRL is not interested in concepts which have already been proven. Results of the research should be directed toward demonstrating generic countermeasure techniques against classes of imaging seeker track processors and designs and their robustness rather than focusing on a specific problem or design.

Address Initial Proposals to Code 5631, or e-mail barone@pcircm.nrl.navy.mil, telephone (202) 404-4246. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**FIBER OPTICS TECHNOLOGY
BAA 015**

The Optical Techniques Branch (Code 5670) of the Naval Research Laboratory (NRL) is interested in receiving proposals which will bolster defense technology in the area of fiber optics technology for a wide range of applications related to Naval needs. In particular these areas include analog communication systems and optical microwave links, digital communication links and computer applications, generic fiber optic sensors (both interferometric and intensity), signal processing of fiber optic signals, and reliability/survivability of fiber optic systems. Innovative component development and subsystem development that either improve the performance of existing systems or generate new applications of fiber optics will be considered. Major areas of interest include large bandwidth laser diodes (or external optical modulators) and high speed detectors, local area networks, sensors for acoustic, magnetic, rate, chemical detection, strain measurement for monitoring material strength, signal processing schemes such as coherent detection, subcarrier multiplexing, and optical control of phased array antennas.

Awards under this BAA will be for scientific study or experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding rather than focused on a specific system or hardware solution. Proposals for evolutionary engineering of improvements are not appropriate under BAA authority and are not acceptable.

It is preferred that proposals be unclassified and include a list of ongoing programs, both internally and externally funded that are related to the proposed work. The durations of these programs are normally 12 to 36 months; for programs over 18 months, the proposal should be divided into a coherent basic task with a Government-exercised option to cover the remaining aspects of the program.

Address Initial Proposals to Code 5650, e-mail esman@ccf.nrl.navy.mil, telephone (202) 767-9359 or Code 5670, e-mail dandridge@ccf.nrl.navy.mil, telephone (202) 767-9340. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**COMPACT MILLIMETER WAVE RADAR TECHNOLOGY
BAA 016**

The Electronic Warfare Strategic Planning Organization (EWSPO) of the Naval Research Laboratory sponsors research to support long-range planning for U.S. Navy electronic warfare systems acquisition. The EWSPO is soliciting proposals for compact millimeter wave (mmW) coherent radar technology for measurement of surface ship and decoy target signatures and to evaluate mmW radar countermeasure technology. Desired characteristics of the measurement radar systems are: (1) the assembly fits in a small form-factor aircraft wing station pod suitable for aircraft captive-carry flights, (2) capability to conduct measurements at Ka-band (35-40 GHz), (3) include signal processing techniques for target classification, and (4) operation at dual frequencies (X-band and Ka-band).

Formal proposals should include: (1) measurement system definition, (2) functional capabilities and design advantages, (3) proposed measurement system design, (4) aircraft back integration requirements, (5) description of signal processing approach, and (6) background and experience of system developers. Proposals must provide new or unique concepts, ideas, or approaches to qualify for evaluation.

Address Initial Proposal's to Code 5700.1, telephone (202) 767-6806. Allow one month before requesting confirmation of receipt of initial proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an initial proposal by NRL. If necessary, NRL will initiate substantive contact. Non-U.S. research institutions are encouraged to submit proposals.

**SMALL AIR VEHICLES DEVELOPMENT TECHNOLOGY
BAA 017**

With a broadening number of missions applicable to unmanned air vehicles, both in the arenas of air and sea warfare, the technology base requires constant expansion to match the ever changing requirements. The Offboard Countermeasures Branch of the Naval Research Laboratory (NRL) is interested in receiving proposals which identify technologies benefiting the development of a relatively small cross section of lightweight, mission specific air vehicles. Areas of interest include, but are not limited to, innovative research in propulsion/energy systems (advanced batteries, fuel cells disk motors, micro-jet and electric engines, etc.), aerodynamic performance, vehicle stability and control, avionics (autopilot sensors and actuators, satellite communication links, global positioning systems), deployment techniques (sea, land, air), structural/material advances, stealth technology, and reconnaissance hardware (to include various imaging systems, i.e. video, infrared). Current projects have identified a need to concentrate on miniaturized systems (in the less than 50 gram range) or technologies which will allow significant scaling of payloads and airframes to the appropriate micro-vehicle size range.

Address Initial Proposals to Code 5712.2, or e-mail at across@ccs.nrl.navy.mil, telephone (202) 767-4475. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**ELECTRONIC WARFARE OPTICAL PROCESSING TECHNIQUES AND
DEMONSTRATION MODULES
BAA 018**

The Naval Research Laboratory (NRL) is interested in applied research for analysis and technology validation demonstration of selected functions and critical elements for optical processing potential technology insertion into military systems. The individual topics will span a period of performance ranging from one to four years. The program goal calls first for development of innovative optical processing technology and modules, possessing performance superiority and environmental durability, that survive critical testing by the developer; such technology and modules may then be used by NRL in technology validation demonstrations at the system level for potential operational Electronic Warfare systems. Developments associated with the following categories are desired:

(1) Electronic Warfare Channelizer (EWC) - Technical Focal Point, (TFP) Code 5721 or e-mail spezio@ccf.nrl.navy.mil, telephone (202) 767-3561. The EWC research challenge is the demonstration of precisely matched state of the art wideband channelizers that operate over a wide input dynamic range.

(2) RF Analog Fiber Interconnects - (TFP) Code 5721, or e-mail treynol@ccfsun.nrl.navy.mil, telephone (202) 767-1167. The critical research issue is low insertion loss over a wide instantaneous frequency span.

(3) Signal Analysis Processor - (TFP) Code 5721, or e-mail alexa@ccf.nrl.navy.mil, telephone (202) 767-2835. The research initiative addresses approaches for characterization of signal modulation for the purpose of noncooperative emitter classification and/or identification. The Signal Analysis Processor technology challenge is throughput processing speed at the accuracy necessary for the classification/identification function.

(4) Direction Finder - (TFP) Code 5721, or e-mail levitt@ccfsun.nrl.navy.mil, telephone (202) 767-3561. Novel techniques and technology that provide a combination of high probability of intercept, large instantaneous bandwidth, and wide field of view RF direction finding constitute the research challenge addressed in the Direction Finder effort.

Address Initial Proposals to the researchers named in the foregoing category description. Allow one month before requesting confirmation of receipt of Initial

Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**NAVAL AIRBORNE ELECTRONIC WARFARE
BAA 019**

The Naval Research Laboratory (NRL) is interested in receiving proposals that address research and development of the technologies required to support future Navy Airborne Electronic Warfare requirements, concepts, and subsystems.

Specific areas of interest include, but are not limited to receivers, threat alert processing, countermeasures from both a single platform and a command and control warfare (C2W) network/distributed system of platforms (including techniques, offboard vehicles, towed devices, and coordinated assets, as well as evaluation methods, models, and simulations), electromagnetic radiation sources, amplifiers, and apertures including Electronically Scanned Arrays). Submitted proposals should consider application to Coherent Radars (PD, PC, LPI), Non-cooperative Target Recognition Radars (SAR, ISAR, HRR), Over-The-Horizon Radars, multi-mode and multi-spectral/multi-frequency (e.g. RF/EO/IR/UV) threats, Ultra-Wide Band Threat Systems, Anti-Radiation Missiles, PROFORMA, millimeter wave, and the conventional threat aspects including homing, tracking, acquisition and search. Novel and creative use of conventional technology, as well as new applications of emerging state-of-the-art technologies, is desired.

Proposals for portions or subset of the efforts are encouraged.

Address Initial Proposals to Dr. Gregory Cowart, Code 5730.00, telephone (202) 404-7650. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SHIPBOARD ELECTRONIC WARFARE
BAA 020**

The Ships Electronic Warfare Branch (SEWS) of the Naval Research Laboratory (NRL) conducts research and development of Electronic Warfare (EW) softkill techniques directed toward the protection of Navy ships. The Branch mission includes the development of EW system and subsystem requirements; development, analysis and evaluation of shipboard ECM systems and subsystems with other shipboard weapons systems; threat assessments; and development of EW operational tactics and concepts.

The Surface EW Systems Branch is interested in receiving proposals for research and development into all of its mission areas. Specific areas of interest include, but are not limited to:

- (1) Timely/near real-time EW effectiveness measurement technology;
- (2) Broadband, multiple-simultaneous-beams antenna technology;
- (3) Multifunction aperture designs and technology;
- (4) Innovative conventional and non-conventional ECM techniques (and systems) for application in all phases of the battle timeline including surveillance, targeting, acquisition, and terminal phases. Threats systems of interest include active monostatic radars in microwave and millimeter wave regions along with anti-radiation systems and multi-mode/multi-spectral systems;
- (5) Counter-targeting ECM techniques/systems for battleforce defense;
- (6) ECM techniques against Low Probability of Intercept (LPI) radars;
- (7) Shipboard EW system modular integration concepts;
- (8) Shipboard sensor fusion techniques;
- (9) Intra-ship information fusion/association techniques;
- (10) Small ship/boat EW systems or subsystems;
- (11) Network-centric battleforce concepts, techniques and systems; and

(12) Millimeter-wave EW transmitter concepts and technologies.

NRL more favorably will consider proposals offering initial increments comprised of short-term studies (6-8 man-months) which then can be used to decide if the research deserves further investment.

Address Initial Proposals to Code 5740, or via e-mail to joseph.lawrence@nrl.navy.mil, telephone (202) 767-5933. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**HIGH POWER MICROWAVE TECHNOLOGY
BAA 021**

The U.S. Navy is interested in exploring the use of High Power Microwave (HPM) techniques and technologies for purposes including anti-ship missile defense (ASMD) and command and control warfare (C2W). The Naval Research Laboratory (NRL) is encouraging joint proposals wherein the project would be executed in a NRL/contractor team format to get the maximum amount of research in the most efficient manner. These proposals for research and development into HPM techniques and technologies may include, but not be limited to:

(1) Wideband (narrow-pulse) HPM sources. The sources of interest range from compact, lightweight devices that may be conventionally or explosively driven to larger, higher voltage devices that are suitable for shipboard installation. Marx generators are one example of several technologies being sought.

(2) Narrowband HPM sources. The sources of interest are generally high duty, relatively long pulse transmitters. Very high peak power, high average power, and high efficiency are all desirable.

(4) Innovative conventional and non-conventional HPM based electronic attack (EA) techniques and systems including anti-missile defense applications, special operations command applications and C2W applications.

(5) NRL more favorably will consider proposals offering initial increments comprised of short term studies (6-8 man-months) which then can be used to decide if the research deserves further investment..

Address Initial Proposals to Code 5740, or via e-mail to joseph.lawrence@nrl.navy.mil, telephone (202) 767-5933 . Any specific security questions should be addressed in advance of proposal submission via separate discussion. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**INNOVATIVE ANTI-SHIP MISSILE - ELECTRONIC WARFARE
SIMULATION TECHNOLOGY
BAA 022**

The Integrated EW Simulation (IEWS) Branch of the Naval Research Laboratory (NRL) conducts research and development in the simulation of anti-ship cruise missile (ASCM) threats that address priority requirements to meet the anti-ship missile defense EW mission.

The IEWS Branch has an ongoing requirement for proposals that address the research and development of innovative new technologies, components, and systems to support the next generation of EW simulation programs. Investigations focus on the basic areas of research into technologies relating to hardware/software simulation of future advanced missile threats to the surface fleet and EW techniques to defend against the advanced threats, as well as methodology to validate the simulators. The ultimate goal of the research is to enable future development of a combination of EW simulation, modeling, and analysis capabilities to meet the Anti-Ship Missile Defense EW mission. Of particular interest are research into innovative simulator architectures capable of multi-signal emissions, reception, signal processing and displays, and signal analysis tools for use in understanding and countering advanced anti-ship, RF guided (active radar, anti-radiation, and LPI) missile threats.

NRL will consider proposals offering short term studies (6-8 man-months) which can be used to decide if the research deserves investments or longer range studies.

Address Initial Proposals to Code 5765, Code 5761, Code 5763, or Code 5762, telephone (202) 767-2208 or 3018, FAX (202) 767-0818 or Code 5760, E-mail rksheew@ccf.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place before evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**ADVANCED SIMULATION FOR ELECTRONIC WARFARE
BAA 023**

The Effectiveness of Navy Electronic Warfare (ENEWS) Program within the Tactical Electronic Warfare (TEW) Division of the Naval Research Laboratory (NRL) is interested in research which will advance the state of the art in assessing the performance of Electronic Warfare techniques. To this end, NRL welcomes proposals that address (but are not limited to) the following areas:

- (1) New methods and techniques for high fidelity RF and IR missile simulations which allow real time performance. Specific interests include assessment methodologies relating to advanced on-board and off-board countermeasures for both anti-ship and anti-air applications.
- (2) Advanced methods for generation of high fidelity signatures and background scenes as applied to real-time/near real-time missile engagement simulations.
- (3) Innovative concepts for interactive and reconfigurable consoles as distributed interfaces into real-time EW simulations.
- (4) Innovative techniques to visualize and render simulations of RF and IR systems.
- (5) Novel techniques to provide rapid scenario generation for creating vignettes that assist in determining the effectiveness of various EW measures.
- (6) Virtual Reality, as it is applied to mission planning, mission rehearsal, and examining the electromagnetic spectrum outside the visual band.
- (7) The mechanism for maintaining a consistent notion of time throughout a distributed simulation.
- (8) A unified, open architecture that will allow different, existing models to be combined within the same simulation framework.

In order to provide a clear understanding of all aspects of the proposed program, classified proposals are acceptable. If the offeror is proposing to perform research in a classified area, indicate the level of classification of the organization, the Principal Investigator and all the proposed personnel, and the agency that issued the clearance;

if a formal (classified) proposal is requested by NRL, an unclassified executive summary should accompany the proposal.

Address Initial Proposals for items (1), (2), and (3) should be addressed to Code 5707.14, e-mail binford@enews.nrl.navy.mil. Initial Proposals for items (4), (5), and (6) to Code 5707.5, e-mail schuette@enews.nrl.navy.mil. Initial Proposals for items (7) and (8) should be addressed to Code 5707, e-mail mcgraw@enews.nrl.navy.mil, telephone (202) 767-6812.

Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**RESEARCH IN DETECTION, TREATMENT AND REDUCTION OF HAZARDOUS
MATERIALS AND DAMAGING ENVIRONMENTAL PROCESSES
BAA 024**

The Naval Research Laboratory (NRL) Chemistry Division (Code 6100) conducts research in the detection, treatment and reduction of hazardous materials. Areas of primary interest include: (1) Characterization of environmental processes and their application to remediation and restoration technologies; (2) Detection, sampling and characterization of chemical and biological agents; (3) Development of unique analytical chemistry tools for more efficient and cost effective sampling processing; (4) Development of genetic- and molecular biological-based tools for toxicological assessment; and (5) Research in alternative fuel sources. Key words describing these research interests include: bioremediation, aerobiology, biosensors, biosurfactants, gene probe technology, biofilms, contaminated sediments, corrosion and biofouling, remote sensing, methane hydrates, carbon cycling and contaminant mineralization. NRL is interested in receiving proposals which address innovative technologies or fundamental approaches related to these research areas.

Initial Proposals of 2-3 pages should be addressed to Code 6110, or e-mail bspargo@ccf.nrl.navy.mil, telephone (202) 404-6392. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Contact between the applicant and NRL should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**INNOVATIVE APPLICATIONS OF MAGNETIC RESONANCE
BAA 025**

The Polymer Diagnostics Section (Code 6122) of the Naval Research Laboratory (NRL) is interested in research proposals involving innovative applications of magnetic resonance. Current research interests include:

- (1) explosives and contraband detection by magnetic resonance; and
- (2) nondestructive evaluation by magnetic resonance imaging and spatially localized magnetic resonance.

Proposals should be closely related to and supportive of these programs. Interested offerors are requested to note the Proposal Preparation and Submission Instructions; in particular, brevity is desirable, and the Initial Proposal, including cost estimates may be only a few pages in length. Supportable research is limited to specialized areas and by financial constraints; therefore, a single page summary of the research concept, with or without a funding estimate, is suggested, even prior to the normal Initial Proposal.

Address Initial Proposals to Code 6122, E-mail garroway@ccf.nrl.navy.mil, telephone (202) 767-2323, FAX (202) 767-0594. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SPECTROSCOPIC AND IMMUNOLOGICAL ASSAY DEVELOPMENT FOR
ENVIRONMENTAL CONTAMINANTS AND DRUGS OF ABUSE
BAA 026**

The Naval Research Laboratory (NRL) is interested in receiving proposals for research in detection technology in the areas of contaminants and drugs of abuse. The Analytical Toxicology Group (Code 6170) addresses a variety of Navy problems and provides specific assistance to the Bureau of Personnel and MEDCOM in these areas. NRL is interested in receiving proposals which involve the following: (1) Developing new screening techniques for drugs of abuse/toxins in diverse matrices; (2) developing new confirmation techniques to analyze drugs of abuse/toxins in diverse matrices; (3) developing new screening/analysis techniques for detection of DNA, RNA, bacteria, or viruses in complex environmental/ biological matrices; (4) remote monitoring of drug use status of individuals and their positional information; and (5) testing of detection technology in law enforcement and rehabilitation scenarios.

Only one copy of the Initial Proposal need be submitted. Brevity of submission (1-2 pages) outlining the concept or technology is desirable.

Address Initial Proposals to Code 6170, E-mail kidwell@ccf.nrl.navy.mil, telephone (202) 767-3575. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**CHEMICAL VAPOR PROCESSING
BAA 027**

The Naval Research Laboratory (NRL) is interested in receiving proposals for research in chemical vapor processing and surface modification. The Surface Chemistry Branch (Code 6170) and the Gas/Surface Dynamics Section (Code 6174) address a variety of Navy problems and provide specific assistance to the SYSCOMS, the Naval Repair facilities, the fleet, and other DoD and government agencies. To accomplish these tasks, the Branch and Section conduct research and development directed to:

(1) increasing our basic understanding of the chemical processing which occurs at the gas-solid interface, and the deposition and processing of advanced materials and structures;

(2) developing new or improved diagnostic sensor (insitu and exsitu) techniques to probe the chemical nature of the gas phase, interface, temperature, and other surface properties;

(3) developing fundamental models and simulation of chemical vapor processing which may assist in intelligent process control and the smart design of materials.

(4) developing new or improved techniques for controlling the flux of chemical species to or from the interface, as well as properties of the interface such as temperature;

(5) depositing and producing coatings/structures/patterns with unique properties;

(6) processing, finishing, metallizing, and/or machining such materials to the appropriate form;

(7) applying these new or improved processing and analytical techniques for use in applications important to the Navy and DoD.

General areas of high current interest include: advanced materials such as diamond, nitrides, carbides and other wide band gap materials; metal organic chemical vapor deposition of coatings, layered structures, and electronic materials; synthesis of chemical precursors; metallization of surfaces; development of appropriate diagnostics,

models, and control strategies for intelligent process control; plasma processing and modeling; and understanding chemical kinetics and fluid transport in the above applications.

Address Initial Proposals (white papers) to Code 6174, or e-mail butler@ccf.nrl.navy.mil, telephone (202-767-1115) or Code 6170, e-mail rcolton@stm2.nrl.navy.mil, telephone (202-767-0801). Allow one month before requesting confirmation of receipt of initial proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**DEVELOPMENT OF MICROMACHINED SENSORS FOR PHYSICAL,
CHEMICAL AND BIOCHEMICAL APPLICATIONS
BAA 028**

The Naval Research Laboratory (NRL) is interested in receiving proposals for research and development of new micromachined sensors to detect a variety of physical phenomena and chemical and biological species. The Advanced Surface Spectroscopy Section (Code 6177) of the Surface Chemistry Branch addresses a variety of Navy problems from drug analysis to anti-submarine warfare. NRL is interested in receiving proposals in the following areas: (1) developing new micromachined sensors to measure physical phenomena such as magnetic and electric fields, pressure, electromagnetic radiation, temperature, humidity, and other meteorological parameters; (2) developing new micromachined sensors to detect chemical species with high selectivity and sensitivity; and (3) developing new micromachined sensors to detect biochemical species with high selectivity and sensitivity.

Address Initial Proposals to Code 6177, or E-mail at lwhitman@stm2.nrl.navy.mil, telephone (202) 404-8845. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SIMULATIONS OF CONDENSED PHASE CHEMISTRY
BAA 029**

Molecular dynamics simulations (allowing for the possibility of condensed-phase chemistry using reactive many-body potentials) are becoming an increasingly important computational and theoretical tool for understanding chemistry at surfaces, interfaces, and in solids.

The Theoretical Chemistry Section of the Naval Research Laboratory (NRL) is interested in receiving proposals to perform molecular dynamics simulations of solid-state and materials-related chemistry. Specific problems of interest include: shock-induced chemical reactions in energetic materials; the dynamics of chemical vapor deposition; and materials processing and growth via cluster-surface collisions. Also of interest to the Theoretical Chemistry Section are simulations of friction and adhesion at the atomic-scale, molecular dynamics simulations of structural and elastic properties of bulk systems, surfaces, and interfaces composed of metals, metal-oxides, and related materials, and molecular dynamics simulations of hypervelocity cluster-surface impacts.

It is anticipated that projects might span two years. Proposals for lesser periods and/or stand-alone subsets of the effort, each individually priced, are encouraged.

Address Initial Proposals to Code 6179, or E-mail at white@alchemy.nrl.navy.mil, telephone (202) 767-3270. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

SHIPBOARD DAMAGE CONTROL AUTOMATION FOR REDUCED MANNING BAA 030

Damage Control Automation for Reduced Manning (DC-ARM) is an advanced technology demonstration of the sensing, decision making, control, actuation, and system integration required to simultaneously support reduced manning initiatives and decrease casualty response time. The primary DC-ARM objective is a greater than 50% reduction in General Quarters (Condition I) surge manning for future ships, particularly DD-21. The DC-ARM product is envisioned as an integrated, automated system for detection, analysis, and correction of casualty conditions relating to shipboard fire protection and fluid control. DC-ARM architecture will be structured into two layers: (1) hardened, component level, reflexive automation collocated with associated sensors and actuators; (2) high level, supervisory, proactive automation software which executes within a generic, open architecture computer shipwide infrastructure. DC-ARM major demonstrations for this project will be conducted onboard NRL's test ship, the ex-USS SHADWELL, under realistic live fires and flooding battle damage conditions in three phases: (1) FY98 baseline evaluation of existing damage control doctrine and technology for the LPD-17 (Navy's newest class design); (2) FY00 remote manual casualty characterization, situational assessment, and decision aids; and (3) FY01 fully automated reflexive response to damage. DC-ARM hardware for FY00/01 demonstrations must conform with shipboard combatant environmental requirements including high impact shock and electromagnetic interference. Offerors may propose partial or integrated solutions within the following task areas:

TASK 1 SENSOR SELECTION (CASUALTY CHARACTERIZATION): Smart, dependable, continuous monitoring, survivable, maintainable, and cost effective damage control sensors are required. Ubiquitous, high confidence sensing of fire, flooding, ventilation, fluid flow and structural integrity is required throughout the ship.

TASK 2 CONTROL INTERFACE (SITUATIONAL AWARENESS): Accurate, real-time situational awareness is required for: (1) low level automated reflexive response; (2) automated reporting to supervisory crew members; and (3) proactive decision aids. Situational awareness software must be highly portable and modular for integration within the overall DC-ARM system.

TASK 3 FIRE AND FLUID CONTROL (CASUALTY RESPONSE): Survivable, hardened control system kernels which are not dependent on higher level computers or networks are required for safe operation of damage control systems. Due to the safety and mission criticality of damage control kernels, breadboard and brassboard prototypes will be developed for evaluation under both laboratory and shipboard conditions.

Thorough testing of brassboard system integrity and fault tolerance is required. Offerors must propose a series of risk reduction steps in preparation for FY00/01 shipboard demonstrations.

TASK 4 SYSTEM INTEGRATION AND TEST: System integration and test must occur incrementally as breadboard and brassboard prototypes become available. Control system kernels must provide modular, redundant interfaces to: (1) damage control sensors and actuators; (2) generic Ship Wide Area Network and computer workstations.

Offerors should respond with technical documentation which is supportive of their concept and which delineates the proposed efforts in phases, with the first phase intended to accomplish enough effort to provide sufficient information or data to demonstrate the feasibility of the entire effort. A typical effort might be defined in terms of a design phase, a fabrication phase and a test phase. This is only a suggested arrangement of a technical proposal and the nature of the proposed effort will depend upon the effort that is being undertaken and the type of work being proposed. However, it is anticipated that the first phase can be completed in approximately 12 months and in the cost range of \$100,000 or less. Proposed efforts, longer or shorter, or in excess of \$100,000 will receive equal consideration and will be judged upon merit of the proposal.

Address initial proposals to Code 6180, e-mail address fwilliam@itd.nrl.navy.mil, telephone (202) 767-2002. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**COMBUSTION DYNAMICS - SUPPRESSION
BAA 031**

The Combustion Dynamics Section of the Naval Research Laboratory (NRL) is investigating the chemistry, physics, and dynamics of combustion. The Center is interested in research proposals in support of its broad-based program including fundamental combustion concepts and processes; flame propagation, enhancement and inhibition; limit phenomena; and fire behavior as applicable to addressing Navy needs. In particular, the Section assists in developing the Navy's short and long range fire protection research and development programs.

A major thrust is identifying and developing substitutes for the environment damaging halons currently employed for fire protection. This includes generation of the mechanisms responsible for flame and fire extinction, with scaling parameters, and the integration of detailed flame suppression in understanding full scale shipboard fire extinction. Fire suppressants can be gaseous, liquid, or solid materials, or physical processes. Innovative instrumental approaches may be required to properly evaluate different laboratory and large scale fire test environments. The desire is to expand knowledge and understanding, and identify and enable implementation of novel and emerging technologies, as opposed to incremental improvements or qualifying specific systems or hardware solutions.

Address Initial Proposals to Code 6185, FAX (202) 767-1716, e-mail sheinson@ccfsun.nrl.navy.mil, telephone (202) 404-8101. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SUPERCONDUCTING MATERIALS
BAA 032**

The Naval Research Laboratory (NRL) is interested in basic research and exploratory development of superconducting materials, devices, components and systems that address crucial Naval and DoD requirements. Although the principal area of interest is in superconductors with transition temperatures in excess of 30K, unusually sound proposals for research and development of devices, components and circuits fabricated from materials with superconducting transition temperatures below 30K will be considered for funding if deemed suitable for potential Naval applications. The areas of research and development activities of interest to NRL include:

(1) Innovative ultra-sensitive electromagnetic sensors and sensor arrays which respond to frequencies from dc through the microwave and millimeter wave regions of the spectrum through the infrared, the visible and into the ultraviolet region of the spectrum with particular emphasis on applications in the areas of Magnetic Anomaly Detection (MAD), mine countermeasures, corrosion detection and Non-Destructive Evaluation (NDE) of materials.

(2) Innovative low loss, wide band passive microwave and millimeter wave devices and components as well as ultra-low noise mixers, detectors, and amplifiers.

(3) Innovative electrically short, and super-directive antennas from the ELF through the millimeter wave regions of the spectrum.

(4) Innovative ultra-high Q-factor cavities for operation in the HP (3-30 MHz) band through the millimeter wave band, especially those that can maintain very high Q-factor values even under large incident power conditions.

(5) Innovative ultra-high throughput, very low power dissipation digital data and signal processing devices and circuits (including analog-to-digital and digital-to-analog converters).

(6) Very low loss, zero frequency-dispersion signal transmission lines.

(7) Very low noise, wide bandwidth superconducting amplifiers from dc through the millimeter wave spectral band.

(8) Magnetic bearings (both very high speed, low load as well as low speed, very high load variety).

(9) HTS superconducting current leads and bus bars.

(10) High temperature superconducting conductors suitable for applications involving high field magnets and solenoids and for current leads for such systems.

(11) Novel design concepts for high temperature magnets operating at temperatures over 20K and producing magnetic fields over 2 Tesla.

(12) Novel and innovative concepts for the use of High Temperature Superconducting (HTS) magnet systems such as, but not limited to, electrical motors and generators, magnetic mine sweeping, magnetic separation of ores, magnetic energy storage, or power conditioning.

(13) Preparation of high quality and high temperature superconductors and the search and development of new superconducting materials.

(14) Techniques for the measurement of the electrical, mechanical, optical and thermal properties of superconducting materials, devices and components.

(15) Innovative cryogenic refrigeration techniques, systems, and cryogenic packaging techniques suitable for use with superconducting and cold electronic devices and circuits.

Projects ranging from short duration to several man-years will be considered.

Address Initial Proposals to NRL Program Office (Code 6300), E -mail nisenoff@estd.nrl.navy.mil, telephone (202) 767-3099 or gubser@anvil.nrl.navy.mil, Telephone (202) 767-2926 or FAX (202) 404-8009. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**MATERIALS PERFORMANCE, PROCESSING, AND MODELING
BAA 033**

The Naval Research Laboratory (NRL) is interested in receiving proposals for research and development in materials, their joining, and their processing, including modeling of materials performance and joining and forming processes to achieve cost-effectiveness. The areas of research and development activities of interest to NRL include, but are not limited to the following:

(1) Microstructural/continuum modeling for the development of predictive equations of state for materials which could greatly reduce costs of developing new alloys and forming processes as well as permit optimization of properties and plant weldable aluminum and iron alloys of high strength, toughness, stress corrosion cracking resistance, reduced hydrogen embrittlement, etc.

(2) Forming and machining of hard-to-form and/or machine alloys by the application of high fields. This may include the application, singly or in combination, of electric, magnetic, ultrasonic, and microwave fields and address the casting and/or forming to near-net-shape by rolling, drawing, or forging and the machining by point cutting or grinding of any low ductility materials such as tungsten alloys, aluminides, etc.

(3) Design of manufacturing processes that achieve desired product attributes at lowest total life cycle cost. This may include the integration of several unit forming processes and the simulation of such processes to account for geometric effects and the effects of evolving material microstructure and temperature and stress fields. Total life cycle spans issues from the initial material synthesis to the final disposition of components including all costs of acquisition and ownership.

(4) Demonstrate the application of "smart materials and structures" (SM&S), in military and dual-use systems. Generically, SM&S should have the capability to sense environmental stimuli, process the acquired data, and actively respond in a controlled manner to achieve a desired goal. This includes a wide range of materials (e.g., shape memory alloys, electrostrictive ceramics, ionic polymers, etc.), control algorithms and signal processors, and their assembly into devices that can be made to perform battle-related actions robotically (e.g., swim, fly, walk, etc.).

Address Initial Proposals to Code 6303, or e-mail sanday@anvil.nrl.navy.mil, telephone (202) 767-2264. Allow one month before requesting confirmation of receipt

of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**THERMOELECTRIC MATERIALS AND DEVICES
BAA 034**

The Naval Research Laboratory (NRL) is seeking proposals for research leading toward the development of new materials and devices for thermoelectric applications.

Thermoelectric phenomena involve the movement of heat by an electric current or the generation of electric power from a thermal gradient. Thus thermoelectrics can and have been used for cooling and heating over a temperature range spanning cryogenic to well above room temperature and for power generation from carefully contrived thermal gradients. Some acknowledged potential uses for this technology would be: providing cooling for such things as cryoelectronics, air conditioning, refrigeration, and various aspects of thermal management; generating significant power from waste heat or power harvesting from small naturally occurring thermal gradients. In fact such applications are already in place but are limited in number and diversity primarily by the low efficiency of thermoelectric based processes compared to other technologies and by other material science and fabrication issues such as the mechanical integrity of the materials and techniques for maintaining ideal geometries of devices over a broad range of device size.

This program focuses on the development of new and improved materials, devices and device fabrication techniques that will lead to new thermoelectric based applications in cooling, heating and power generation. The goals include higher efficiency materials and devices, enhanced device reliability and new kinds of both devices and device fabrication techniques.

Address Initial Proposals to Code 6341, or e-mail ehrlich@anvil.nrl.navy.mil, telephone (202) 767-6269. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an initial proposal by NRL. If necessary NRL will initiate substantive contact.

**THICK FILM FERRITE MAGNETIC MATERIALS
BAA 035**

The Naval Research Laboratory (NRL) is seeking proposals to research technologies based on magnetic materials that can benefit advanced military systems.

Ferrites are a class of magnetic material that has a very important role in microwave and millimeter wave components. These components are an important part of a diverse range of military electronics from radar to electronic warfare to communications. Recent advances in the fabrication of thick film ferrites both by PVD and tape casting have the potential for significant cost reductions for military systems and can enable civilian applications of this advanced technology, like collision avoidance radar for future automobiles. With the development of high quality deposited films of these ferrites, the integration of these magnetic oxides with the semiconductor active microwave and millimeter wave circuits is a goal of this program; the program can lead to enhanced performance, again at significantly reduced cost.

This program focuses on developing technologies based on magnetic materials that can lead to the development of novel ferrite circulators, phase shifters and filters employing thick film ferrites that are targeted at an order of magnitude smaller size, lower loss, and integrability with the appropriate semiconductor elements to form a monolithic, high performance circuit with a goal of an order of magnitude lower cost.

Address Initial Proposals to Code 6342, or e-mail [lubitz@anvil.nrl.navy.mil](mailto:lubit@anvil.nrl.navy.mil), telephone (202) 767-4207. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**CERAMIC MATERIALS
BAA 036**

The Multifunctional Materials Branch of the Naval Research Laboratory (NRL) Code 6380, is interested in receiving proposals for exploratory development of techniques for design and preparation of high performance ceramic materials and ceramic composite materials. This research should stress the development of novel processing techniques, material combinations, and accompanying design tools and codes. NRL is particularly interested in such materials for various applications, including functional ceramics and ceramic-based composites for electronics, smart materials and structures, sensors and actuators, and sonar devices and arrays. There is also interest in new materials and low cost processes for thermostructural applications such as advanced heat engines, high temperature structures, radomes, and Irdomes. The key aspects of proposed research efforts should include attainment of performance at least as good as existing materials, and development of materials and processes which promise production of materials and components at substantial cost reduction over competitive approaches. One or more examples of any materials, devices, components, or systems and software developed under this effort shall be delivered for testing and performance analysis by the Navy.

Address Initial Proposals to Code 6380, or e-mail lewis@anvil.nrl.navy.mil, telephone (202) 767-2131. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**HIGH PERFORMANCE COMPUTING ON MASSIVELY PARALLEL
ARCHITECTURES
BAA 037**

The Laboratory for Computational Physics and Fluid Dynamics of the Naval Research Laboratory (NRL) conducts research, which supports the national initiative in high performance computing. Advanced algorithms and codes are developed for the newest massively parallel architectures. This research is pursued in the fields of compressible and incompressible fluid dynamics, reactive flows, fluid/structure interaction including submarine and aerospace applications, atmospheric and solar geophysics, magnetoplasma dynamics, fire modeling, engine modeling, molecular dynamics and quantum chemistry. We are interested in receiving proposals for research that address the following topics:

- (1) Novel modeling and simulation of complex combustion systems involving multi-phase fuel injection such as droplets, sprays and particulate matter in a gaseous background.
- (2) Innovative characterization of sound generation and investigation of methods to increase fuel-air mixing, reduce noise and pollution from jet engine exhausts using direct and large eddy simulation techniques.
- (3) Innovative development of efficient approaches for the massively parallel processing of detailed chemical kinetics mechanisms and the development of simplified chemistry models for inclusion in multidimensional simulations of flames, fire and detonations.
- (4) Novel finite difference modeling for large scale studies with general boundary conditions and modeling of local phenomena in multidimensional magnetofluids.
- (5) Innovative many-body simulation models for plasma phenomena.
- (6) New radiation transport and equation of state models for inclusion in highly parallelized and vectorized hydrodynamic simulation codes which address stellar processes such as coronal heating and solar flares, and laboratory plasmas, in which the effects of radiation transport and non-ideal equations of state are relevant.
- (7) Novel techniques for structured and unstructured grid-based unsteady flow solvers for complex, three-dimensional flows. This research would also address

parallel load balancing and adaptive refinement and remeshing for unsteady flows. CAD interfaces with grid generators and unsteady flow solvers for multiple moving surfaces and bodies in relative motion, bodies in and near a free surface, and bodies in turbulent separating flows are also sought.

(8) Innovative simulations of high-Knudsen-number flows using direct simulation Monte Carlo Methods, applied to microdynamics and materials processing.

(9) Innovative simulations of multi-phase flows at very low Reynolds numbers.

(10) Development of innovative techniques for the simulation of low Reynolds number flows through complex geometries.

(11) Innovative modeling of elastic-plastic flows and flow interactions with solid deformable boundaries. This work would include shock loading in sand and/or explosive effects on deformable bodies.

(12) Innovative unstructured grid-based unsteady flow solvers for compressible flows such as aircraft and missile aerodynamics, blast dynamics and loading, and structural response to unsteady loads.

(13) Development of innovative and efficient numerical techniques for the simulation of fluid flow and chemical phenomena relevant to fires in enclosures.

(14) Development and application of numerical simulation models needed to support decisions in protection of buildings, facilities, and/or military platforms from the threat of chemical/biological incidents. Focus is on containment transport and particle deposition in and around generic buildings and building complexes, including coupling of external and internal environments.

Address Initial Proposals to Code 6401, or e-mail sandberg@lcp.nrl.navy.mil, telephone (202) 767-0526. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**RADIATION EFFECTS IN SEMICONDUCTOR, SUPERCONDUCTOR AND OPTO-ELECTRONICS
BAA 038**

The effect of radiation from natural and artificial sources on military systems, notably satellites, must be determined and minimized. The sources include trapped particles in the radiation belts and cosmic rays ions in space and at high altitude and nuclear radiation environments. The military systems of interest range from space systems to systems employed in the atmosphere. The effects of interest include single event effects due to trapped protons, solar event particles and cosmic ray particles, total dose effects especially those at space rates, and displacement damage effects.

The Naval research Laboratory (NRL) is interested in receiving proposals which address the effects, susceptibility and hardening of military systems to particulate radiations regardless of source. Semiconductor and superconductor devices (including low power devices and other advanced technologies) solar cells, and materials are of interest. Space experiments, photonics, and particle and radiation detectors are also of interest. Devices and subsystems which are important to future space systems, but which have questions about survivability earth's radiation belts are of particular interest. The proposals may deal exclusively with, or involve a combination of theoretical and computational work, and laboratory or field-testing. Awards under this BAA will not be made to harden existing devices except to the extent that such a "hardening" demonstrates how the proposed research will advance the state-of-the-art.

Work to be accomplished under any resultant contract may be classified to the level of Secret and may require access to and storage of classified material. It is anticipated that projects may span two years. Proposals for lesser periods and/or stand-alone subsets of the effort, each individually priced, are encouraged.

Address Initial Proposals to Code 6820, or e-mail at campbell@ccf.nrl.navy.mil, telephone (202) 767-9043. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**DIRECTED ENERGY WARFARE SUSCEPTIBILITY AND HARDENING
BAA 039**

Directed Energy Warfare (DEW) is a major emerging military technology. It involves the effects of laser, microwave, charged particle or neutral particle beams on any tactical or strategic military system on the surface of the earth, in the air or in space. The assessment of the susceptibility of military components, subsystems, systems and platforms to DEW, and the hardening of these components against such weapons, is necessary to the development of offensive and defensive capabilities in this area.

The Naval Research Laboratory (NRL) is interested in receiving proposals which address the effects of directed energy weapons and their amelioration. Conceptual studies, analyses, investigatory hardware development, and laboratory and field measurements fall within the scope of this announcement.

Awards under this BAA will not be made to harden existing devices except to the extent that such an "assessment" or "hardening" demonstrates how this will advance the state-of-the-art. For example, if an innovative method of assessment is proposed, a contract cannot be awarded for a complete assessment of the susceptibility of a particular military component to DEW; only deliverables necessary to demonstrate the innovative method can be procured under a BAA. Services for a complete study would be procured by other means.

Work to be accomplished under any resultant contract may be classified to the level of Secret and may require access to and storage of classified material.

It is anticipated that projects may span two years. Proposals for lesser periods and/or stand-alone subsets of efforts, each individually priced, are encouraged.

Address Initial Proposals to Code 6330, E-mail wieting@ccf.nrl.navy.mil, telephone (202) 767-2101. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**MATERIALS SCIENCE OF ENERGETIC THIN-FILM DEPOSITION PROCESSES
BAA 040**

Thin films and coatings have become the bedrock of high technology electronic and optic devices, for protective coatings in aerospace and tooling, and now for micro mechanical devices. Furthermore, as traditional structural materials reach their limit in strength, coatings and surface modification are the only means to obtain an increase in material performance.

The Naval Research Laboratory (NRL) is interested in receiving experimental and theoretical proposals that address the fundamental processes which control film microstructure and properties, and that characterize and apply the resulting films. Topics of interest include the formation of new metastable phases, epitaxial growth, films with controlled nanophases, fabrication of tailored composition profiles, multiplayer films for opto-electronics, optics, and biomedical applications, and hard coatings for wear and corrosion resistance. Fundamental research includes the effects of ion bombardment on gas adsorption and desorption, on film orientation, microstructure, adhesion and intrinsic stress.

Address Initial Proposals to, Code 6370, or e-mail Hubler@ccf.nrl.navy.mil, telephone (202) 767-4786. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**Novel Ion Beam Analysis Techniques
BAA 041**

Analysis of surfaces by low energy (keV to MeV) ion beams is used extensively in materials research, especially for thin-films. The Naval Research Laboratory (NRL) conducts such analyses using its 3 MV Pelletron and 200 keV ion implantation facilities.

In order to enhance the Navy's capabilities in the general area of surface analysis by ion beams, the Naval Research Laboratory is interested in receiving experimentally new approaches to ion beam analysis that may involve new particle scattering geometry's new detection schemes, new electronics advances for improved energy resolution and coincidence timing resolution, new methods of simultaneous detection of particle-particle, particle-gamma, gamma-gamma coincidences, new compact accelerator designs, and enhancements in ion sources or beam transport. Creative use of a 180 degree, double focusing magnetic spectrometer or an Enge-Split-Pole magnetic spectrograph (1.5-meter-long focal plane) are sought.

Address Initial Proposals to Code 6370, or e-mail grabowski@ccf.nrl.navy.mil, telephone (202) 767-5738. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contract.

**Chemical, Biochemical, and Physical Sensing Materials,
Transducers, and Sensor Systems
BAA 042**

The physiochemical properties of materials designed to react to chemical, biochemical, and physical environmental changes are utilized in many devices and systems to monitor environmental conditions.

The Naval Research Laboratory (NRL) is interested in receiving proposals that address the optimization of transducers and sensor systems. Topics of interest include: the design and fabrication of novel optical, mass, and electrically responsive sensors and related systems, chemoselective and biochemical selective materials, characterization of the physicochemical properties of materials, development and application of solvation equations, materials deposition techniques, development and application of techniques for fabrication of microelectronic components by direct write methods, antennae design and fabrication, and , development and application of pattern recognition techniques for data analysis.

Address Initial Proposals to Code 6370, or e-mail amcgill@ccf.nrl.navy.mil, telephone (202) 767-0063. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contract.

**DYNAMICS OF SOLIDS
BAA 043**

The generation, transport, and utilization of X-ray, XUV, and visible radiation have contributed greatly to our understanding of fundamental processes in condensed matter. Both laboratory and synchrotron radiation sources, as well as major laser and pulse-power facilities, have been used in this effort. Recent advances in available power, wavelength tunability, and pulse duration promise to expand greatly our ability to study existing materials and to assist in the development of new, technologically important materials and structures.

The Naval Research Laboratory (NRL) is interested in receiving proposals which address the use of radiation interactions to explore the dynamic behavior of solids. Theoretical and analytical proposals are acceptable, although proposals involving the production and transport of radiation and its interaction with condensed matter are preferred. Proposals may involve any particular combination of solid-state systems to be studied and radiation-based techniques to be used in the research.

Work to be accomplished under any resultant contract may be classified to the level of Secret and may require access to and storage of classified material.

It is anticipated that projects may span two years. Proposals for lesser periods and/or stand-alone subsets of efforts, each individually priced, are encouraged.

Address Initial Proposals to Code 6140, or e-mail bell@ccf.nrl.navy.mil, telephone (202) 404-7543. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**CONDENSED MATTER THEORY
BAA 044**

Condensed Matter theory and computation has become an increasingly important tool for the understanding of existing, and the development of new materials. The marriage of theoretical formalisms and the ability to generate theoretical "data" on the computer is important to the Navy's materials efforts.

The Naval Research Laboratory (NRL) is interested in receiving proposals to perform theoretical and computational studies of materials involving the electronic structure and applications, in areas such as mechanical or transport properties, phase transitions, magnetism, superconductivity, and the theory of alloys; or in areas using model Hamiltonian methods (e.g., Hubbard Hamiltonian approaches) geared to uncovering exotic, new phenomena. Although proposals can have purely formal theoretical aspects, there should be a focus toward implementing the ideas on high-performance computers.

Although the work in this area is generally unclassified, there is the possibility that aspects of the research may require access to classified documents, and hence, the research projects may from time to time be classified up to the Secret level. It is anticipated that projects may span two years. Proposals for lesser periods and/or stand-alone subsets of the effort, each individually priced, are encouraged.

Address Initial Proposals to Head, Complex Systems Theory Branch, Code 6390, telephone (202) 767-6886. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**PLASMA PHYSICS DIVISION
BAA 045**

The Naval Research Laboratory (NRL) is interested in receiving proposals that address basic and applied experimental, theoretical and computational research to advance fundamental knowledge in high temperature plasmas.

Specific areas of interest include:

(1) Advanced computer models combining hydrodynamics and radiation physics in dense plasmas; atomic physics in high intensity fields.

(2) Theoretical and experimental studies of krypton-fluoride laser systems. Theoretical and experimental studies of the effects of laboratory thermonuclear explosions upon the chamber walls and upon the final optics. Study of laser-matter interactions and strongly-coupled plasmas.

(3) High energy pulsed power systems employing capacitive and inductive energy storage; production of pulsed plasma and intense high-power, charged particle beams including single pulse and high average (rep-rated) power systems.

(4) Theoretical and large-scale computational modeling of ionospheric, magnetospheric, solar and space plasmas; observational diagnostics of the near-earth space environment.

(5) Nonlinear dynamics and chaos; theoretical studies and computer simulations of nonlinear dynamic phenomena and novel nonlinear algorithms for use in applications such as signal processing, analysis of complex data sets, neural architectures, and control systems.

(6) Theoretical and experimental research in the areas of coherent radiation sources including gyrotrons, magnicons and free-electron lasers; theoretical and computational research in beam transport simulations, intense laser-plasma interactions, intense laser-electron beam interactions, and modeling of plasma processing.

(7) Diagnostic and data handling/analysis techniques applicable to pulsed or dc measurements for remote sensing, and laser-matter interactions including real time diagnostics and post-interaction analysis.

(8) Theoretical and experimental research and development for high power RF sources, beam handling systems and pulsed or continuous plasma discharges; analysis of moderate temperature discharge plasmas using innovative spectrographic and electrical diagnostics.

(9) Theoretical and experimental research on high frequency microwave processing of ceramics including modeling of intense microwave-material interactions and development of low cost, high power millimeter wave applicators and sources.

The foregoing description should be interpreted within the following guidelines which apply to all BAA topics but are stated here for emphasis: (1) NRL is not interested in concepts that have already been developed or proven; (2) NRL seeks proposals for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding; and (3) deliverables should demonstrate the results of scientific study and experimentation rather than focus on a specific system or hardware solution. Proposals for evolutionary improvements are inappropriate under BAA authority and are not desired.

Address Initial Proposals to Dr. V. L. Patel, Code 6701, or e-mail patel@ccf.nrl.navy.mil, telephone (202) 767-2997 or 767-5635. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**DEVELOPMENT OF IMPROVED MICROELECTRONIC INTEGRATED
CIRCUIT ELECTRONICS
BAA 046**

The Naval Research Laboratory (NRL) is seeking proposals for research and development of improved microelectronic integrated circuit (IC) technology. These proposals may include basic research on improved fabrication processes, breakthroughs in integrated circuit technology, improved understanding of damage mechanisms, innovative development of improved materials or structures, and development of novel radiation tolerant ("radiation hard") technology.

Technologies of interest include all major, current integrated circuit materials, including silicon metal-insulator-semiconductor (MOS), bipolar, GaN, SiC, and GaAs materials.

Current programs of interest include:

(1) Research on improved, integrated circuit technology on Silicon-on-Insulator (SOI) materials. Topics of interest include developing improved isolation oxides, circuit designs, effects at high radiation dose levels, transient radiation effects, scaling to small geometry (as small as 0.1 μm gate length) devices, partially- and fully-depleted SOI, etc. Current emphasis is on CMOS on SOI, but other concepts such as lateral bipolar on SOI are also of interest. Current problems in radiation hardening of CMOS on SOI include developing improved isolation (mesa edge or trench) techniques, hardening techniques which do not require substrate bias, development of fully depleted CMOS/SOI, and the development of very large-scale integrated circuit technology.

(2) Research on improved understanding of radiation effects in integrated electronic devices and structures. This research involves studies of the nature of defects created in the oxides and insulators and in microelectronics, and the chemistry of the formation of these defects.

(3) Development of CMOS IC technology for applications at cryogenic temperatures (below 100K). Topics of interest are (a) innovative detectors and signal processing electronics for infrared imagers, and (b) applications wherein the improved performance obtainable at cryogenic temperatures is a major advantage, as for low-power, high-speed digital systems.

Current programs mainly involve basic and applied research on improvements in radiation hard IC technology for military applications. This includes research on radiation effects and hardening, and the long-range development of techniques for hardening. Examples of issues of concern include structural components of the integrated circuit, including gate oxide, field oxide, or isolation oxide, etc., and the component devices, such as field-effect transistor, capacitor, inverter, etc. The proposals may cover improved understanding and/or radiation-hardening of the structural components or devices, or it may involve fabrication and testing of complete integrated circuit test chips. Hardening techniques of interest may include device level techniques, including improved fabrication, or circuit level techniques, including design, layout, etc.

Address Initial Proposals to William C. Jenkins, Code 6816, or e-mail Jenkins@estd.nrl.navy.mil, telephone (202) 767-2104. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**ADVANCED IRFPA TECHNOLOGY FOR NAVY APPLICATION
BAA 047**

The Solid State Devices Branch (Code 6810) of the Naval Research Laboratory (NRL) is interested in receiving proposals which will advance Infrared Focal Plane Array Technology. The Navy requires IR sensors forIRST, FLIR, and missile seeker applications. The general areas of interest are long wavelength, midwave and multispectral detector development. NRL is interested in the following areas:

- (1) Innovative infrared detectors based on II-VI materials (including, but not limited to HgCdTe heterojunction detectors).
- (2) Monolithic focal planes including "on focal plane" signal processing (including, but not limited to TDI and correlated double sampling).
- (3) Long wavelength infrared detectors based on III-V strained layer materials (including, but not limited to GaInSb/InAs or InAsSb/InSb superlattices).
- (4) Long wavelength infrared detectors based on intersubband absorption in multiple quantum well structures other than GaAs/AlGaAs (including, but not limited to SiGe/Si, GaSb/AlSb).
- (5) Read-out integrated circuit approaches for "on focal plane" signal conditioning, including but not limited to gain and offset correction.

The proposals should be oriented toward 6.2 category funding. Offerors may respond to one or more of the areas of interest, but each should be submitted as a separate proposal.

Address Initial Proposals to Code 6818, e-mail Waterman@estd.nrl.navy.mil, telephone (202) 404-7945 or Killiany@estd.nrl.navy.mil, telephone (202) 767-2524. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**RF VACUUM ELECTRONICS
BAA 048**

The Vacuum Electronics Branch (Code 6840) of the Naval Research Laboratory (NRL) is seeking proposals for innovative technology base development in the broad area of RF vacuum electronics. Areas of interest include, but are not limited to: (1) advanced high power millimeter-wave amplifiers suitable for radar and electronic warfare applications; (2) the microwave or millimeter-wave power module (MPM) consisting of a solid-state driver, a vacuum electronics power booster, and integrated power conditioning; (3) technologies and techniques to reduce life cycle cost and improve overall reliability of vacuum electronic devices now used or projected for use in U.S. military systems; (4) software modules to support an advanced computational environment for the computer-aided design of microwave and millimeter-wave power vacuum electron devices; (5) supporting technology to advance RF vacuum electronics; and (6) advanced emitter technology. Each area is briefly described below:

(1) High power millimeter-wave amplifiers. The overall goal of this area is to develop the technology base required for advanced high-performance millimeter wave amplifiers suitable for radar, communications and electronic warfare applications. Proposals detailing device concepts relating to the development of compact, efficient vacuum electronic amplifiers operating in the millimeter wave bands (>30 GHz), at peak power levels from 100W to hundreds of kilowatts, and average power levels of 100W to tens of kilowatts. Devices should be capable of operation with instantaneous fractional bandwidths of 1% to 20% or higher. Topics of interest include, but are not limited to, (a) innovative high power device concepts; (b) advanced high-power electron optics and millimeter wave components technology; and (c) compact high gain, moderate power (100 W typical) millimeter wave technology.

(2) Microwave and millimeter-wave power modules, consisting of a solid-state driver, a vacuum electronics power booster, and integrated power conditioning, will find near-term applications in many military and civil systems, including electronic decoys, phased arrays, and high-data-rate communications. Proposals are encouraged under this solicitation that address topics such as (a) improved magnetics to provide high-quality high-perveance electron beams within module cross-section and weight constraints; (b) improved beam-wave interactions and depressed-collector designs to enhance power booster efficiencies; (c) innovative waste heat removal designs for a dimensionally-constrained MPM; (d) improved solid-state amplifier performance at high-junction temperatures; (e) novel power conditioning schemes to provide spectral purity for radar applications; (f) development of low-loss passive components and devices to minimize overall system losses; (g) improved power conditioning components such as

high voltage diodes and capacitors suitable for high-density power conversion; (h) three-dimensional fully-electromagnetic computer modeling; and (i) innovative approaches to developing MPM architectures leading to low unit acquisition costs, and (j) innovative power extraction schemes capable of providing small cross-sectional power modules for m X n array applications.

(3) Designing for low-cost consists of innovative design for fabrication in which critical design elements are identified and novel solutions are offered in order to minimize cost, supported with manufacturing analysis as evidence. DoD microwave power tube procurements have traditionally been low-volume runs of limited duration; production of power tubes for certain high-volume applications, such as decoys, is currently too costly. Proposals detailing concepts consistent with these area objectives, that are aimed at decoupling unit cost from production volume, are encouraged under this solicitation.

(4) The Modeling and Simulation program is focused on the development of advanced design and simulation capabilities of vacuum electronic devices.

The trade-off consideration used in designing of vacuum electron devices strongly depends on the application of the particular device and on the availability of design tools. Modeling and Simulation program requires both the development of general state-of-the-art computational design codes and validation of these codes. The numerical tools should address the electromagnetic, electron beam wave interaction, thermal and mechanical issues and the development of device specific electron gun/collector, large signal and stability analysis design codes. The devices of interest include, but not limited to: helix and couple-cavity TWT's, multiple-beam klystrons and gyrodevices. The design tools can use steady state or time-dependent models focusing on one-dimensional, two-dimensional or three-dimensional aspects of the problem. In concert, within the design methodology framework, the design tools should be capable of optimizing the performance of the device by maximizing the efficiency, gain, linearity, bandwidth and minimizing the noise.

(5) Supporting Technology encompasses the development of materials and technologies that can potentially benefit broad classes of vacuum power amplifiers and oscillators. Proposals that detail innovations and breakthroughs in any one of a variety of technical areas in this context are encouraged. Technical areas include, but are not limited to: (a) noise characterization, modeling, and reduction techniques for vacuum power amplifiers; (b) innovative materials research for vacuum power devices, including mechanical and electromagnetic characterization, modeling, and materials development - high thermal conductivity insulators, BeO replacement materials, materials with

tailored electromagnetic losses; and (c) mass- and volume-efficient magnetic materials and magnetic structures to support compact, fieldable systems.

(6) Advanced emitter technology covers both established and evolving options for cathodes and electron emission issues in RF vacuum electronic devices. Proposals that detail breakthroughs and innovations in any one of a variety of technical issues within this context are encouraged. Examples of topics include but are not limited to: (a) vacuum microelectronics, (b) reduced electron affinity concepts; (c) the development of high current density, long-lived thermionic cathodes, (d) secondary emission enhancement and control for cathodes in crossed field devices; and (e) improved collector design and materials, including methods to suppress secondary electron emission in collectors.

Addresses for Initial Proposals and for brief descriptions of sub-topics are as follows:

Paragraph	E-Mail	Code	Telephone number
(1) & (5)	Danly@mmace.nrl.navy.mil	6843	(202) 767-0032
(1)& (4)	Levush@mmace.nrl.navy.mil	6841	(202) 767-0037
(2),(3) & (6)	Abrams@mmace.nrl.navy.mil	6844	(202) 404-7163
(5)	Calame@mmace.nrl.navy.mil	6843	(202) 767-0033
(5)	Abe@mmace.nrl.navy.mil	6843	(202) 767-0033
(6)	Jensen@mmace.nrl.navy.mil	6841	(202) 767-3114

Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**RESEARCH IN BIO/MOLECULAR SCIENCE AND ENGINEERING
BAA 049**

The Center for Bio-Molecular Science and Engineering (Code 6900) of the Naval Research Laboratory (NRL) conducts multidisciplinary research in biotechnology using the techniques of modern molecular biology, biophysics, chemistry, microelectronics, and engineering to fabricate biosensors, biomaterials, and advanced systems. Current research areas include:

- (1) Biophysical chemistry of membranes.
- (2) Research into biosensors including construction of novel devices, accessories for automated reagent delivery, production of biomolecular recognition elements or configuration of bioassays for integration into the sensor. Targets of detection include explosives, pollutants, pathogens, toxic agents, and hazardous chemicals.
- (3) Genetic engineering of biomaterials.
- (4) Self assembled films and patterns for advanced material development.
- (5) Liposomal delivery of vaccines and pharmaceuticals.
- (6) Physical characterization of thin films and surfaces.
- (7) Microwave devices, ultramicroelectrodes and electron emitters based on metallized composites. Microwave materials based on nanodimension powders and metallized composites.
- (8) Self-assembly of microstructures for advanced materials, including tubules, advanced ceramics and ceramic sol gels, and the assessment of potential applications including: controlled release, advanced composites for electronic, structural, and thermal applications, and environmental applications.
- (9) Selective patterning of biological materials (proteins, cells, nucleic acids) on solid substrates.
- (10) Methods for the preservation of blood substitutes and blood cellular components in the dry state; efficacy studies of the preserved material to include in-vitro and in-vivo testing.

(11) New materials and methods that will accelerate the healing rate of soft and/or hard tissue injury; demonstration of biocompatibility and efficacy should be demonstrated in both in-vitro and in-vivo models.

(12) Development of novel lithographic, patterning, and/or metallization processes for high resolution imaging, fabrication of advanced microelectronic or nanoelectronic devices, displays, biosensors, multilayers, or three dimensionally structured materials.

(13) Advanced materials using liquid crystals and ordered polymers, relation between molecular structure and material properties, assessment of their properties for potential applications in the areas of real time holography, ferroelectric phenomena, high resolution display, pyroelectric sensors, and piezoelectric material, electro-optic materials, non-linear optics, and optical wave guiding.

(14) Self-assembly of nano-scale structures such as bicontinuous cubic phase and assessment of their use for technological applications in the areas of controlled release, encapsulation, and nanocomposites.

(15) Remediation of oily and contaminated water using physical or phase-separation processes.

The NRL is inviting Initial Proposals for applied and basic research in areas closely related to and supportive of these programs. It is expected that multiple projects may result with each targeted to a particular technology or application area.

Address Initial Proposals to Code 6902, e-mail mas@cbmse.nrl.navy.mil, telephone (202) 404-6015. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**PHYSICAL/STRUCTURAL/ACOUSTICS
BAA 050**

The Naval Research Laboratory (NRL) is interested in proposals of theoretical and experimental studies of acousto-elastic systems and parameters by means of physical techniques, and of physical techniques, and of physical systems and parameters by means of acousto-elastic techniques. NRL's experimental programs are mainly carried out in a laboratory setting, typically involving state-of-the-art digital electronic, optical, fiber optic, acoustic, and material systems. A large component of the work is carried out in the three acoustic pool facilities operated by NRL and in its low temperature-microstructures laboratory. Results are obtained in solids, fluids, and composites by observing the effect on elastic and acoustic waves resulting from interactions between these waves and materials and structures possessing various properties, shapes, and surfaces.

Sub areas of structural acoustics include:

- (1) The development of advanced numerical modeling approaches that deal with complex sound-fluid-structure interaction problems.
- (2) The development of new measurement methodologies and technologies for characterizing sound-fluid-structure interactions.
- (3) Structural acoustic research into the scattering and radiation of sound from underwater structures and the mechanisms that govern these phenomena.

Sub areas of physical acoustics include:

- (1) Researching advanced measurement techniques for studying phonon propagation and elastic vibrations in microstructures.
- (2) Researching the relationships between microstructure, material parameters, and phonon/elastic wave behavior.

Address Initial Proposals to Code 7130, e-mail bucaro@ccf.nrl.navy.mil, telephone (202) 767-2491. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**STRUCTURAL ACOUSTICS
BAA 051**

The Naval Research Laboratory (NRL) is conducting research programs in the scattering and radiation of sound from structures immersed in a fluid or poro-elastic medium. Areas of research interest include:

- (1) modeling of sound fields in the fluid or poro elastic medium and of the vibration of the structure,
- (2) modeling of the effects of boundaries in the fluid, particularly including effects due to penetration of the bounding medium, and
- (3) inverse scattering and data processing techniques for obtaining information concerning the scatterer from the scattered fields, including image enhancement technology.

Address Initial Proposals to Code 7131, or e-mail couchman@ccf.nrl.navy.mil, telephone (202) 767-3336. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SHALLOW WATER TOMOGRAPHY
BAA 052**

The Naval Research Laboratory (NRL) is interested in tomographic techniques for shallow water environments. Techniques which take into consideration the complex nature of shallow water acoustic propagation are needed. Both the dynamic water column and sediment parameters are of interest. Approaches within the context of multi-dimensional normal mode theory or the parabolic-equation method are desired. Research on the optimal number and placement of assets, and theoretical performance limits, will also be considered. Cooperative research and at-sea trials are encouraged.

Address Initial Proposals to Code 7140, or e-mail to perkins@abyss.nrl.navy.mil, telephone (202) 767-9037; FAX (202) 404-7732). Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**PHYSICS-BASED ACTIVE SONAR SIGNAL PROCESSING
BAA 053**

The Naval Research Laboratory (NRL) is conducting a research and technology program in environmental identification and target classification in bottom-limited, shallow-water environments. Interest is focused on low-frequency (below 1 kHz) and mid-frequency (1 to 5 kHz). Research combines theoretical, numerical and experimental analysis. NRL is interested in innovative research proposals on:

- (1) signal processing techniques for in-situ estimation of the acoustic pressure field and environmental parameters in a shallow-water environment,
- (2) signal processing techniques for the classification of low-Doppler targets, and
- (3) clutter suppression techniques based on waveform design or adaptive signal processing to combat reverberation.

Deliverables should demonstrate the results of scientific study and experimentation rather than focus on a specific systems or hardware solution. Proposals for evolutionary improvements are inappropriate under BAA authority and are not desired.

Address Initial Proposals to Code 7140, or e-mail, Drumheller@caludette.nrl.navy.mil, telephone (202) 404-4815. Allow one month before requesting confirmation of receipt. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantial contact.

**ENVIRONMENTAL IMPACT ON ACTIVE ACOUSTIC SYSTEMS
BAA 054**

The Naval Research Laboratory (NRL) is conducting a research and technology program on the detailed nature of ocean-acoustic boundary and volume interactions and their impact on active system performance. Interest covers a broad range of frequencies (from 50 Hz to 10 kHz) for the full range of systems and environments, with particular interest in shallow water and bottom-limited applications. Research combines theoretical, numerical and experimental analyses to achieve results. NRL is interested in research proposals on:

- (1) Innovative physics-based algorithms for both clutter characterization and control;
- (2) Innovative signal-processing-based environmental adaptation schemes for multistatic active systems in adverse environments; and
- (3) Innovative approaches to measure and model 3-D acoustic scattering and propagation in shallow water. This includes acoustic interaction with both the ocean boundaries and inhomogeneities in the ocean volume (such as fish).

Address Initial Proposals to Code 7144, or e-mail roger.gauss@nrl.navy.mil, telephone (202) 767-3524. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**ACOUSTIC SIMULATION, MEASUREMENTS AND TACTICS
BAA 055**

The Naval Research Laboratory (NRL) conducts broad-based research in ocean acoustics to better understand the effects of the ocean environment on underwater acoustics, and to assess and predict how these environmental effects will impact the performance of Naval systems, operations, and missions. The "ocean environment" includes three-dimensional, time-evolving features such as rough air-sea interfaces, sub-surface bubbles and plumes, volume effects (e.g., internal waves, solitons, fluctuating media, biologics, pollutants, fronts, eddies), rough sea-floor interfaces, and ocean bottom and sub-bottom regions. "Underwater acoustics" includes all acoustic processes and interactions that can occur within the ocean environment (e.g., propagation, scatter, attenuation, dispersion, mode conversion, coherence, ambient noise and sediment penetration). "Naval systems, operations, and missions" include, but are not limited to, sonar systems, Anti-Submarine Warfare (ASW), Mine Counter Measures (MCM), warfare effectiveness, and strategy and tactics optimization. Numerical techniques and computer codes are developed as required to support the Navy's need for improved ocean acoustics models and data bases and to provide supporting analysis for operational and tactical application of computer models.

Current major areas of research interest include:

- (1) Acoustic Simulation and Modeling (e.g., theoretical formulations, computational acoustics, numerical modeling, inverse methods, stochastic methods, visualization, and scalable computer and supercomputer code development);
- (2) Warfare Effectiveness (i.e., research in advanced methods of assessing environmental impact on Naval missions and strategy optimization);
- (3) High-Frequency Acoustics (i.e., MCM and weapons frequencies as related to the effect of the environment on the performance of Navy sonar systems, including the effects of the medium coherence, bottom roughness, sediment composition, clutter and their effects on advanced imaging techniques); and,
- (4) Coastal Acoustics, as related to the application of sophisticated signal processing methodologies (e.g., matched field processing and high-order spectral techniques), to determine the limits and variability of harsh environments on the performance of Navy sonar systems.

Other research interests include:

a) The combination of acoustics with other sensing techniques, such as optics, magnetism, electromagnetism, hydrodynamics, geophysics and others for both ASW and MCM applications;

(b) Acoustic environmental characterizations, data base modeling, and analysis of those aspects of the marine environment relevant to acoustic propagation; and

(c) coupled target-waveguide modeling and target recognition, classification, and discrimination.

Proposals for evolutionary improvements are inappropriate under BAA authority and are not desired.

Address Initial Proposals to Code 7180, e-mail chinbing@nrlssc.navy.mil telephone (228) 688-4798, or, e-mail j.mcdermid@nrlssc.navy.mil, telephone (228) 688-5254. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**UPPER TROPOSPHERE AND MIDDLE ATMOSPHERE RESEARCH
BAA 056**

The Remote Sensing Physics Division (Code 7200) of the Naval Research Laboratory (NRL) is interested in proposals for basic and applied research on the composition and physical state of the earth's upper troposphere and middle atmosphere (stratosphere and mesosphere) as it relates to Navy and DoD operations and climate change. The focus of this research is global remote sensing of composition, particularly water vapor, ozone and constituents related to ozone photochemistry, and high fidelity modeling to predict atmospheric evolution. Proposals may address any of the following specific research areas:

- (1) Scientific interpretation of ground and space based remote sensing data in the context of current dynamical and photochemical models.
- (2) Innovative scientific analysis of ground and space based remote sensing data on water vapor, ozone and other constituent global altitude distributions.
- (3) Innovative microwave, millimeter-wave, and optical sensors for constituent sensing. Research proposers in this area should be aware of existing NRL spaceflight programs such as the Millimeter-wave Atmospheric Sounder and Polar Ozone and Aerosol Monitor and ground-based sensors in the Network for Detection of Stratospheric Change.
- (4) Innovative research related to the use of databases from the DMSP program for upper troposphere, middle atmosphere and climate research.
- (5) New sensor concepts including Lidar, infrared spectroscopy and imaging spectroscopy for middle atmosphere and climate research.

Awards under this BAA will be for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding rather than focused on a specific system or hardware solution. Proposals for evolutionary engineering of improvements are inappropriate under BAA authority and are not acceptable.

Proposers may respond to one or more of the areas of interest or may propose clearly related investigations; however, each area requires an individual and complete proposal which will be separately evaluated.

It is anticipated that the program may span three years. Research may be conducted at the unclassified level and proposals must be unclassified.

Address Initial Proposals to Dr. Philip Schwartz (Code 7200), telephone (202) 767-2351, or e-mail pschwartz@ccf.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**REMOTE SENSORS AND IMAGING SYSTEMS
BAA 057**

The Remote Sensing Division (NRL Code 7200) conducts a program of basic research, science, and applications aimed at the development of new concepts for sensors and imaging systems for objects and targets on the Earth and in the near-Earth environment, as well as deep space. The research focuses on the discovery and understanding of the basic physical principles and mechanisms that give rise to the background environmental emission and targets of interest and to absorption and emission mechanisms of the intervening medium. The development effort includes active and passive sensor systems to be used for the study and analysis of the physical characteristics of phenomena that give rise to naturally occurring background radiation, such as that due to the Earth's atmosphere and oceans, as well as man-made or induced phenomena such as ship/submarine hydrographic effects. The research includes theoretical, laboratory, and field experiments leading to ground based, airborne and space systems for use in such areas as remote sensing, astrometry, astrophysics, surveillance, environment and improved operational support systems for the Navy. Areas of interest include all levels of the atmosphere (lower, middle, and upper) and space environment, air/sea interface and oceanography. Special emphasis is given to developing space-based sensors and improving the exploitation of existing space systems. Innovative research is desired in areas of interest including, but not limited to, the following:

- (1) The impact of the physics of atmosphere and ocean interaction on physical and biological sea surface characteristics, from the viewpoint of global surveillance systems.
- (2) Research attempting breakthrough advancements in imaging data compression methodology, scene classification, and coherent/non-coherent sensor exploitation.
- (3) Atmospheric gases and aerosol measurements. Research in this area is wide ranging: propagation effects, pollutant monitoring, global climate change, and cloud physics.

The foregoing description should be interpreted within the following guidelines which apply to all BAA topics but are stated here for emphasis: (1) NRL is not interested in concepts that have already been developed or proven (even if they have never been sold before); (2) NRL seeks proposals for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge and understanding; (3)

proposals of services or for evolutionary engineering of improvements are inappropriate under BAA authority and are not desired; (4) deliverables should demonstrate the results of scientific study and experimentation rather than focus on a specific system or hardware solution.

Address Initial Proposals to Dr. Davidson Chen, Code 7207, telephone 202-404-8127, FAX 202-404-7453, or e-mail dchen@ccf.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**OPTICAL INTERFEROMETRY
BAA 058**

The Remote Sensing Division (Code 7200) of the Naval Research Laboratory (NRL) is developing an imaging optical interferometer for use in developing, demonstrating, and exploiting synthetic aperture interferometry. This instrument the Navy Prototype Optical Interferometer, is described in a paper by Armstrong, *et al.* (1998, *Astrophysical Journal*, 496, 550-571). NRL is interested in proposals for innovative basic and applied research leading to the development of new capabilities and applications for this instrument, the development of new techniques for interferometric imaging or for other innovative science or technical development related to interferometry.

Proposers may respond to one or more areas of interest or may propose clearly related investigations; however, each area requires an individual and complete proposal which will be separately evaluated.

Research may be conducted at the unclassified level and proposals must be unclassified.

Address Initial Proposals to Dr. Lee J. Rickard, Code 7210, telephone (202) 404-7877, or e-mail rickard@rsd.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**OPTICAL REMOTE SENSING OF THE COASTAL REGIME
BAA 059**

The Remote Sensing Division (Code 7200) of the Naval Research Laboratory (NRL) is developing instruments for the remote sensing of coastal waters, near shore areas and other coastal regions by means of passive optical sensors. NRL is interested in proposals for basic and innovative applied research which will lead to predictive models for the performance of these instruments, future improvements in these instruments, or novel methods of optical remote sensing suitable for future systems.

Proposers may respond to one or more areas of interest or may propose clearly related investigations; however, each area requires an individual and complete proposal which will be separately evaluated.

Research may be conducted at the unclassified level and proposals must be unclassified.

Address Initial Proposals to Dr. Lee J. Rickard, Code 7210, telephone (202) 404-7877, or e-mail rickard@rsd.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**LOW FREQUENCY RADIO INTERFEROMETRY
BAA 060**

The Remote Sensing Division (Code 7200) of the Naval Research Laboratory is developing an imaging HF/VHF radio interferometer for use in developing, demonstrating, and exploiting interferometric imaging through the ionosphere at low frequencies. NRL is interested in proposals for innovative basic and applied research leading to the development of new capabilities and applications for this instrument; the development of new techniques for wide-field interferometric imaging, ionospheric phase correction, or interference excision; or for other innovative science or technical development related to long wavelength radio interferometry.

Proposers may respond to one or more areas of interest or may propose clearly related investigations; however, each area requires an individual and complete proposal which will be separately evaluated.

Research may be conducted at the unclassified level and proposals must be unclassified.

Address Initial Proposals to Dr. Lee J. Rickard, Code 7210, telephone (202) 404-7877, or e-mail rickard@rsd.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**PASSIVE MICROWAVE REMOTE SENSING
BAA 061**

The Remote Sensing Division (Code 7200) of the Naval Research Laboratory (NRL) is developing instruments, models and retrieval algorithms for remote sensing of the oceans, atmosphere and land using passive microwave techniques (microwave radiometry). NRL is interested in proposals pertaining to basic and innovative applied research leading to improvements in instrumentation or modeling, predictive models for performance of these instruments, or new methods or applications of passive microwave remote sensing suitable for the Navy's present and future needs.

Proposers may respond to one or more areas of interest or may propose clearly related investigations; however, each area requires an individual and complete proposal which will be separately evaluated.

Research may be conducted at the unclassified level and proposals must be unclassified.

Address Initial Proposals to Dr. Peter W. Gaiser, Code 7223, telephone (202) 767-8253, or e-mail gaiser@vaximg.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**COASTAL AND MARINE AEROSOL MODELING RESEARCH
BAA 062**

The Remote Sensing Division (Code 7200) of the Naval Research Laboratory (NRL) is developing a process-oriented aerosol model for coastal regions as well as the open ocean. The model will be used to test our understanding of the processes affecting the size distribution and composition of aerosols in these regions and to predict the effect of aerosols on the attenuation of electro-optical signals. Integration of the aerosol model with 3-D meteorological models is planned. NRL is interested in proposals for basic research on the multicomponent, sectional approach to process-oriented modeling to improve and extend the model currently under development.

Address Initial Proposals to Dr. James Fitzgerald, Code 7228, telephone (202) 767-2362, or e-mail Fitzgerald@ccf.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**REMOTE SENSING OF THE LITTORAL ZONE
BAA 063**

The Remote Sensing Division (Code 7200) of the Naval Research Laboratory (NRL) is interested in proposals for basic and applied research on the remote sensing of the coastal and littoral ocean processes using spaceborne and airborne imaging devices. Proposals may address any of the following specific research areas:

(1) Models and inversion techniques for extraction of geophysical parameters from active/passive microwave imaging devices.

(2) Innovative image analysis and pattern recognition techniques for automatic detection and tracking of oceanographic phenomena.

(3) Multisensor data fusion.

(4) Innovative sensors.

Proposers may respond to one or more areas of interest, or may propose clearly related investigations; however, each area requires an individual and complete proposal which will be separately evaluated.

Address Initial Proposals to Dr. Richard Mied, Code 7250, telephone(202) 767-2176, or e-mail mied@ccf.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**COASTAL REMOTE SENSING CLASSIFICATION
BAA 064**

The Remote Sensing Division (Code 7200) of the Naval Research Laboratory (NRL) is interested in proposals for basic and applied research on coastal remote sensing classification processes using space-borne and air-borne imaging sensors. Proposals may address any of the following specific research areas:

(1) Modeling and algorithm development for the extraction of geophysical parameters from active/passive imaging sensors.

(2) Innovative image analysis and pattern recognition techniques for coastal terrain classification and for automatic detection and tracking of oceanographic phenomena.

(3) Multi-sensor image data integration and fusion techniques.

(5) Innovative sensor data analysis and processing techniques.

Proposers may respond to one or more areas of interest, or may propose clearly related investigations; however, each area requires an individual and complete proposal which will be separately evaluated.

Address Initial Proposals to Dr. Ralph Fiedler, Code 7260, telephone 202-767-0644, or by e-mail sealab@ccf.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**OCEANOGRAPHIC REMOTE SENSING
BAA 065**

The Remote Sensing Division (Code 7200) of the Naval Research Laboratory (NRL) is developing and investigating innovative approaches in extracting geophysical parameters from remote sensors over coastal and open ocean areas. Derived parameters include, but are not limited to, the relationships, surf characteristics, intensity modulation transfer function, and wave damping due to natural or man-made slicks. A critical element in this activity is the ability to verify and validate theory and applied algorithms initiated by the proposer. NRL is interested in proposals for basic and applied research which will further an understanding of physical oceanography, supported by sea truthing activities.

Proposers may respond to one or more areas of interest, or may propose clearly related investigations; however, each area requires an individual and complete proposal which will be separately evaluated.

Address Initial Proposals to Dr. Ralph Fiedler, Code 7261, telephone (202) 767-6644, or e-mail sealab@ccf.nrl.navy.mil. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**OCEAN DYNAMICS AND PREDICTION
BAA 066**

The Ocean Dynamics and Prediction Branch (Code 7320) of the Naval Research Laboratory (NRL) is interested in proposals of basic and applied research in its mission areas. Ocean dynamics and prediction includes basic and applied research in computer modeling of ocean hydro/thermodynamics (i.e., ocean circulation and density structure), modeling of ice dynamics, computational numerical techniques, data assimilation and the analysis of satellite oceanographic data as related to the development of modeling and data assimilation capabilities. Deep ocean basins, marginal and semi-enclosed seas, and coastal regions are of interest. Expanded ocean physics included in such systems and areas for future research and development include ocean tide and wave and surf modeling as well as upper ocean processes. Research in computational techniques includes the study of efficient solutions to partial differential equations arising in oceanography with a special focus on efficient utilization of massive parallel processing technology. The ocean nowcast/forecast and simulation systems have broad and direct application to issues related to Naval operations (ASW, Search & Rescue, Amphibious landing, Mine and Special Warfare, Mission Planning, etc.). These systems also are directly applicable to the simulation and design of global, regional and coastal observing systems as to global climate change.

Address Initial Proposals to Code 7320, or e-mail Harding@nrlssc.navy.mil, telephone (228) 688-4870. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**REAL-TIME OCEANOGRAPHIC SENSORS
BAA 067**

The Meso and Fine Scale Ocean Physics Section (Code 7332) of the Oceanography Division is interested in proposals to develop sensor systems that acquire the in-situ spatial and temporal properties of oceanographic environmental parameters including wave height, wave direction, currents, temperature, salinity, wind speed and wind direction. Innovative ideas, and trawl-resistance designs, real-time data access and culvert operations are of high interest.

Address Initial Proposals to Code 7332, or e-mail paul.hwang@nrlssc.navy.mil, telephone (228) 688-4708. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**AIRBORNE AND SHIPBOARD DATA ACQUISITION AND ANALYSIS
BAA 068**

The Marine Physics Branch (Code 7420) of the Naval Research Laboratory (NRL) is interested in receiving proposals for research and development in the areas of sensor technology, data acquisition, and data analysis in the field of fixed sensor, airborne and shipboard remote sensing.

The primary areas of interest are gravity and inertial measurements, ocean acoustic data, GPS navigation and radar/laser profilometry. This research may involve new techniques in non-traditional beam forming and signal discrimination for the purpose of synthesizing acoustic arrays from randomly emplaced acoustic sensors. The research may involve new and innovative research in long-range kinematic differential GPS navigation with a goal of producing decimeter level positioning of aircraft for baseline lengths of up to 1,000 kilometers. The research may also involve new methods of acoustic modeling combining the water column with sub-bottom acoustic characteristics in both shallow and deep-water regions.

Code 7420 particularly desires proposals on innovative techniques for: (1) real-time acquisition and storage of data at high rates from numerous sensor channels; (2) real-time high-speed data analysis and display; and (3) optimal combined processing of multi-sensor data.

Address Initial Proposals to Code 7420, or e-mail john@hp8c.nrl.navy.mil or skip@hp8c.nrl.navy.mil, telephone (202) 767-2024. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SEAFLOOR SCIENCES
BAA 069**

The Naval Research Laboratory's (NRL) seafloor sciences areas of interest include geochemical, geophysical, and geotechnical investigation advancing the state-of-the-art in these disciplines.

Research conducted includes investigation and modeling of the fundamental micro to macro-structural properties which control sediment geoacoustic and geotechnical properties and which are a function of depositional and post depositional processes.

Investigations include biological, geological, geochemical, historical, and subsequent diagenetic processes that control distribution, range, and variability of sediment physical properties including bathymetry, roughness, and subseafloor morphology. NRL develops state-of-the-art laboratory, in situ, and remote sensing instrumentation to measure required geophysical, geoacoustic, and geotechnical properties both under controlled laboratory conditions and the field. Research emphasizes subbottom acoustic studies at frequencies ranging from high to ultra low. NRL is responsible for developing, assessing, and improving models and data bases for all seafloor properties of interest to the Navy.

Address Initial Proposals to Code 7430, or e-mail sam.tooma@nrlssc.navy.mil, telephone (228) 688-4657. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**MAPPING, CHARTING, AND GEODESY
BAA 070**

The research focus is on development and exploitation of new technology and techniques to support all aspects of mapping, charting, and geodesy including advanced sensors, algorithms, and processing techniques for hydrographic and geophysical surveying, navigation science, digital cartography, map design and displays, and data extraction and compression techniques. Research interest areas are:

(1) Mapping science research and development is conducted in image processing methods and techniques to extract environmental information such as bathymetry, seafloor bottom type, and acoustic provinces from remote optical and acoustic system data.

(2) Research in Geographic Information Systems, map compression, data base design and standardization, and data interpretation and display is conducted to generate more accurate, less cluttered, digital mapping and charting products. Development of image maps, bathymetry/shoal extraction techniques, and compressed aeronautical charts developed at NRL is also performed.

(3) Advanced sensor research and development is performed on active and passive sensors and navigational systems with survey charting applications primarily in support of Navy requirements. Hydrographic sensors and data extraction/processing using acoustic, electromagnetic and optical instruments are developed and tested in an effort to collect information faster, with better accuracies, and higher densities than existing techniques provide. Research in geophysical sensor development, algorithms and processing techniques emphasize mapping of magnetic and gravity fields and their variability.

Address Initial Proposals to Code 7440, or e-mail harris@nrlssc.navy.mil, telephone (228) 688-4420, Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**ATMOSPHERIC EFFECTS, ANALYSIS, AND PREDICTION
BAA 071**

The Marine Meteorology Division of the Naval Research Laboratory (NRL), Code 7500 is interested in proposals for innovative basic and applied research in atmospheric sciences to increase our understanding of atmospheric circulation and to advance the state-of-the-art in numerical analysis and prediction techniques, from short-term meso-gamma-scale to global-scale and longer-term phenomena. Areas of active interest include numerical methods, parameterization and explicit prediction of physical processes, assimilation of remotely sensed and other non-conventional data sources, dynamic initialization, variational analysis and adjoint techniques, predictability and sensitivity issues, tropical/extratropical teleconnections, tropical cyclone prediction, air-sea interaction, large eddy simulations, aerosol modeling, and coupled air-land-ocean-wave models.

We are also interested in proposals that provide new and novel ideas for providing environmental support directly to the warfighter. Areas of particular interest include exploitation of atmospheric information from observations and numerical models to derive tactical weather parameters, and research that increases our knowledge of the effects of the atmospheric environment on ship and air platforms as well as on shipboard, airborne, and land-based communications, sensors and weapons systems. Examples of specific research topics include meteorological applications of remotely sensed data, artificial intelligence techniques and expert system development, aerosols and electro-optical effects; ducting, refractivity, and electro-magnetic effects.

Address Initial Proposals for research related to numerical analysis and prediction systems to Code 7530, or e-mail Hodur@nrlmry.navy.mil, telephone (408) 656-4788. Initial Proposals for research and atmospheric effects on Naval systems should be addressed to Code 7540, or e mail Tsui@nrlmry.navy.mil, telephone (408) 656-4738. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**RESEARCH INTO SPACE - ITS IMAGING AND MODELING
BAA 072**

The Naval Research Laboratory (NRL) is interested in receiving proposals that address basic and applied experimental, theoretical and computational research to advance fundamental knowledge in solar-terrestrial physics, atmospheric science, astronomy and astrophysics.

The research is conducted by the Space Science Division, and the results are of importance to utilization of the space environment, to weather prediction, and to fundamental understanding of natural radiation and geophysical phenomena.

Address Initial Proposals to Code 7602, or e-mail shea@ssd5.nrl.navy.mil, telephone (202) 767-3631. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SPACE ELECTRONICS
BAA 073**

The development of electronic systems for space applications has been facilitated by the Defense Department focus on strategic systems. In the current political and budgetary climate, this focus is no longer present, and the space electronics industry is less interested in the development of parts and components for space systems. In this era, new and innovative solutions must be found to the problem of developing and qualifying components for long duration low orbit satellite systems. The Space Systems Development Department is interested in research which attempts to provide novel and creative approaches to this problem.

Address Initial Proposals to Code 8110, or e-mail Fox@ssdd.nrl.navy.mil, telephone (202) 767-0520. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**INNOVATIVE SPACEBORNE PAYLOAD TECHNOLOGY
BAA 074**

The Space Systems Development Department of the Naval Research Laboratory (NRL) is soliciting proposals for basic and applied research in payload technology. The intent of this research is to advance the state of the art through innovation in spaceborne payload components, subsystems and techniques. Relevant areas of interest include, but are not limited to: (1) advanced RF amplifiers, detectors and synthesizers; (2) adaptive thresholders; (3) frequency and amplitude measurement devices; (4) digitizers and characterizers; and (5) data handling systems.

Specific technologies that are of interest include but are not limited to: (1) High Electron Mobility Transistor (HEMT); (2) Microwave Integrated Circuit/Monolithic Microwave Integrated Circuit (MIC/MMIC); (3) digital frequency discriminators; (4) photonic devices; (5) embedded digital signal and data processors; and (6) high density packaging technology.

The following aspects are of special interest:

- (1) Applicability to the space environment.
- (2) Improvement of performance vs. size, weight, and power over existing technology.
- (3) Flexibility and adaptability of functionality and performance.

Proposals for all, portions of, or stand-alone subsets of the above areas of interest are encouraged.

Address Initial Proposals to Code 8120, or e-mail Webster@kingcrab.nrl.navy.mil, telephone (202) 404-8270. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**INNOVATIVE SPACE SYSTEMS ALGORITHMS, DATA HANDLING
AND PROCESSING
BAA 075**

The Space Systems Development Department of the Naval Research Laboratory (NRL) is soliciting proposals for basic and applied research in algorithms, data handling and data processing. The intent of this research is to foster innovation to benefit the performance of flight qualifiable systems. Hardware, software, algorithms, and related development methodologies are employed in a variety of NRL experiments. Data compression, data reduction and analysis, experiment control, single processor and multi-processors and applicable real-time operating systems, are areas of interest.

Anticipated hardware systems must ultimately be able to operate in the space environment, exhibit total dose, single event upset (SEU), and single event latchup (SEL) tolerance, and must offer redundancy and/or fault tolerant operation for high reliability applications.

Proposals for all, portions of, or stand-alone subsets of the above areas of interest are encouraged.

Address Initial Proposals to Code 8120, or e-mail Webster@kingcrab.nrl.navy.mil, telephone (202) 404-8270. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**PASSIVE LOCATION SYSTEMS TECHNOLOGY
BAA 076**

The Space Systems Development Department of the Naval Research Laboratory (NRL) is soliciting proposals for basic and applied research in passive location systems. The intent of this research is to investigate concepts for exploiting data from various sensor platforms to meet Navy needs for military applications. Areas of interest include the identification, measurement, and exploitation of acoustic and electromagnetic signals. However, this interest is in scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding rather than focused on a specific system or hardware solution.

Specific technologies that are of interest include but are not limited to: (1) single and multiple aperture approaches; (2) single and multiple platform methods; and (3) doppler, phase and amplitude techniques.

Proposals for all, portions, or stand-alone subsets of the above areas of interest are encouraged.

Address Initial Proposals to Code 8120, or e mail Webster@kingcrab.nrl.navy.mil, telephone (202) 404-8270. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**GLOBAL POSITIONING SYSTEM (GPS) APPLICATIONS
BAA 077**

The Space Systems Development Department of the Naval Research Laboratory (NRL) is soliciting proposals for basic and applied research in GPS applications. The intent of this research is to identify innovative concepts to meet future requirements. Creative concepts are sought that utilize new and emerging technologies as well as anticipated improvements in sensor technology, VHSIC and VLSI technology, advanced communications technology, emerging signal processing techniques and improved computing capability. Potential applications span both time and position knowledge related techniques utilizing GPS technology. Novel approaches to post processing, both single ended and differential GPS measurements are of interest.

Proposals for all, portions of, or stand-alone subsets of the above areas of interest are encouraged.

Address Initial Proposals to Code 8120, or e-mail to Webster@kingcrab.nrl.navy.mil, telephone (202) 404-8270. Allow one month before requesting confirmation of receipt of Initial Proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an Initial Proposal by NRL. If necessary, NRL will initiate substantive contact.

**SPACEBORNE PAYLOAD TECHNOLOGY
BAA 078**

The Space Systems Development Department of the Naval Research laboratory (NRL) is soliciting proposals for basic and applied research in optical payload technology. The intent of this research is to advance the state of the art through innovation in spaceborne optical payload components, subsystems and techniques. Proposals for cooperative research are encouraged. Relevant areas of interest include, but are not limited to: space qualified CCD arrays and associated on board processing and reporting capability to be incorporated into an experimental satellite to measure the positions and motion of the stars in the 5th to 15th visual magnitude. The optical reference frame defined by the positions of the bright stars (visual magnitude <9) has an accuracy of one milliarcsecond (10-10 radians). Improvement in this reference frame is needed for precise position determination in space. Space measurements have the ability to improve this optical reference frame to accuracies of the order 10 - 50 microarcseconds (10-13 radians).

Additional relevant areas of interest include, but are not limited to:

- (1) optical scanning systems;
- (2) very large format CCD's;
- (3) highly stable thermal platforms;
- (4) innovative Optical to Electrical conversion techniques, and
- (6) very high throughput data handling systems.

The following aspects are of special interest:

- (1) Applicability to the space environment.
- (2) Improvement of performance vs. size, weight, and power over existing technology.
- (3) Flexibility and adaptability of functionality and performance.

Proposals for all, portions of, or stand-alone subsets of the above areas of interest are encouraged.

Address Initial Proposals to Code 8133, or e-mail johnson@ssdd.nrl.navy.mil, telephone (202) 767-0892. Allow one month before requesting confirmation of receipt of initial proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an initial proposal by NRL. If necessary, NRL will initiate substantive contact.

**LOW-COST PHASED ARRAYS
BAA 079**

The Radar Analysis Branch of the Radar Division at the Naval Research Laboratory (NRL) conducts research and development into concepts and techniques to develop innovative phased array radar antennas to meet U.S. Navy missions.

One of the most versatile antennas is a phased array that uses a phase shifter or a T/R module behind each radiating element. The high cost of phased arrays is limiting their adaptation into the fleet. The main reason for this high cost is the combination of large numbers and significant cost of individual phase shifter or T/R modules. Therefore, proposals using an individual phase shifter or T/R module behind each radiating element will not be considered. The Radar Analysis Branch is interested in receiving proposals for investigating innovative concepts and developing low-cost phased arrays. Projects may span two years.

Address initial proposals to Dr. J. Rao, Code 5317, or e-mail rao@radar.nrl.navy.mil, telephone (202) 767-2578. Allow at least one month before requesting confirmation of receipt of initial proposal, if confirmation is desired. Substantive contact should not take place prior to evaluation of an initial proposal by NRL. If necessary, NRL will initiate substantive contact.